A REVISION OF THE MONAXONID SPECIES DESCRIBED AS NEW IN LENDENFELD'S "CATALOGUE OF THE SPONGES IN THE AUSTRALIAN MUSEUM." Part i.

By E. F. Hallmann, B.Sc., Linnean Macleay Fellow of the Society in Zoology.

(Plates xv.-xxiv.)

Introduction.

In view of the many serious inaccuracies found by Mr. Whitelegge and myself in the portions, revised by us, of the "Catalogue of the Sponges in the Australian Museum," and my further discovery that, contrary to Mr. Whitelegge's assumption, the specimens standing as the types of the species therein described are not in every case to be relied upon as authentic, I have deemed it advisable to continue much further my investigations in regard to those species before proceeding with other work intended for publication on Australian sponges. The results of these investigations, in so far as they pertain to the Monaxonida, it is the purpose of the present paper to set forth.

The material upon which the revision has chiefly been based, consists of the reputedly original specimens preserved in the Australian Museum, and of sample-fragments of an incomplete duplicate set of specimens belonging to the British Museum. The correspondingly labelled specimens of the two sets, however, are not always in agreement; and among the latter are included examples of species which are not to be found in the existing collection of the Australian Museum. At the same time, a number of the Monaxonid species described in the Catalogue are unrepresented in either set of examples. In the case of the former specimens—all of which are labelled in Dr. Lendenfeld's own handwriting—the original labels, as a rule, bear only

"manuscript" names, and for the published equivalents of these dependence has mainly to be placed on a synonymic list (hereinafter referred to as the key-list) furnished by the author of the Catalogue at the request of the Museum Trustees some years after his departure from Australia: the specimens also have attached to them labels added by Mr. Whitelegge, indicating their correct names according to the key-list, and marking them to be the type-specimens.

The examination of portion of this material, undertaken in connection with my previous paper, disclosed that many of the specimens were altogether incompatible with the descriptions of the species they purported to represent; and that, as a rule, considerable disagreement existed between description and specimen even in those cases in which the latter had to be adjudged as beyond question correctly labelled. So far as the evidence then forthcoming enabled one to determine, however, the discrepancies observed were, with two exceptions, such as it seemed necessary to attribute either to inaccuracy of observation on Dr. Lendenfeld's part or to a mislabelling of the specimens; the exceptions —both of which I referred to in my previous paper—were in connection, firstly, with *Clathrissa arbuscula*—the figure given in illustration of which is in reality one of *Clathriodendron arbuscula*; and, secondly, with the two so-called varieties of *Thalassodendron rubens*, the descriptions of whose skeletal characters should be interchanged. The investigation of the remaining material, while proving the descriptions to be almost without exception faulty (often even to an extreme degree), has resulted in the discovery that errors of the kind last-mentioned are by no means of isolated occurrence in the Catalogue; in other words, that not a few of the figures are wrongly designated, and that in repeated instances the disparity between specimen and description is in consequence of the fact that the description is an account partly of the external features of one species and partly of the internal features of another. The former of these extraordinary errors were comparatively easy of detection, and are indubitable, since the actual specimens from which the figures were taken have been found; but those affecting the descriptions only

became apparent, at a late stage of the investigation, as a result of accumulated circumstantial evidence, and have been responsible for the chief difficulties which the task of revision has presented.

The alterations in nomenclature which have been found necessary in connection with the species revised are indicated in the lists given below. In the first list, the left-hand column gives the names under which the species were described or figured in the "Catalogue," and the right-hand the names of the species as now accepted. Where the original name is preceded by the sign †, it is intended to indicate that the species described by Whitelegge under that name was wrongly identified; the correct name of the latter species is given in the second synonymic list. In the case of each of the species whose name is followed by the sign + (only), there is good reason to believe that the original description was based upon two species, only one of which is with certainty known. The single asterisk(*) placed before several of the names indicates a doubt as to whether the specimen examined was a genuine example of the species—and, accordingly, a doubt as to whether the name is really correct. Finally, the double asterisk(**) is employed to denote that the species is known only from its description; and where in addition the name is enclosed within brackets, the description is regarded as insufficient, even if it be correct, to enable one to say positively to what genus the species belongs. Certain of the last-mentioned species were referred to in my previous paper, and assigned doubtfully to the genus *Wilsonella*; but I now consider it better to allow them to remain under their original names.

List A.—Synonymy of the Species, as far as revised by me, of Lendenfeld's "Catalogue."

Tethya multistella var. *megastella*	***Donatia lyncurium* (?) var. *multistella.*
Tethya multistella var. *microstella*	***Donatia lyncurium* (?) var. *microstella.*
Tethya corticata.	**Donatia ingalli* var. *lævis.*
Tethya fissurata	*Donatia fissurata.*
Tethya inflata	**Donatia ingalli* var. *lævis.*
Tethya phillipensis	*Donatia phillipensis.*
Tethya lævis	*Donatia ingalli* var. *lævis.*

Tethyorrhaphis lævis	*Tethyorrhaphis lævis.*
Tethyorrhaphis tuberculata	*Tethyorrhaphis lævis.*
Tethyorrhaphis gigantea	*Tethyorrhaphis lævis.*
Tethyorrhaphis conulosa	*Tethyorrhaphis lævis.*
Sollasella digitata	*Sollasella digitata.*
Spirastrella australis	*Spirastrella* (?) *australis.*
Papillina panis (descr.)	*Spirastrella papillosa* R. and D.+ *S. papillosa* v. *porosa* Dy.
Papillina panis (fig.1)	*Cliona* (*Papillissa*) *lutea*
Papillina panis (fig.2)	*Spirastrella* (?) *ramulosa.*
Papillina ramulosa	*Spirastrella* (?) *ramulosa.*
Raphyrus hixonii	*Cliona* (*Papillissa*) *hixoni.*
Papillissa lutea	*Cliona* (*Papillissa*) *lutea.*
Suberites domuncula	**Suberites* spp.
Plectodendron elegans	*Caulospongia elegans.*
Chondrosia collectrix	*Chondrosia* (?) *collectrix.*
Reniera collectrix	*Chondrosia* (?) *collectrix.*
†*Reniera australis*	*Reniera australis.*
Reniera megarrhaphea	*Amorphinopsis megarrhaphea*+.
Reniera pandœa	*Hemitedania anonyma* Crtr.+.
Reniera lobosa	***Reniera lobosa.*
Petrosia hebes	*Petrosia hebes.*
Halichondria rubra	*Hemitedania anonyma* Crtr.
Halichondria rubra var. *digitata* (descr.)	*Hemitedania anonyma* Crtr.
Halichondria rubra var. *digitata* (fig.)	*Raspailia agminata* sp.n.
†*Halichondria mammillata*	***Halichondria* (?) *mammillata.*
†*Halichondria clathriformis*	*Thrinacophora clathriformis.*
†*Reniochalina stalagmitis*	***Reniochalina stalagmitis.*
†*Reniochalina lamella*	***Axinosia* (?) *lamella* (?+).
Stylotella digitata	*Stylotella agminata* Ridl.
Stylotella polymastia (descr.)	*Ciocalypta* (?) *polymastia.*
Stylotella polymastia (fig.)	*Histoderma actinioides* sp. n.
Stylotella rigida	*Stylotella agminata* Ridl.
Stylotella aplysillioides	***Hymeniacidon aplysillioides.*
Rhizochalina ramsayi	*Phloeodictyon ramsayi.*
Rhizochalina petrosia	*Phloeodictyon petrosia.* +*Ciocalypta* (?) sp.
Gellius panis	***Gellius panis.*
Gellius raphidiophora	*Gellius raphidiophora.*
Tedania rubicunda	*T. digitata* var. *rubicunda.*
Tedania laxa	*Stylotella agminata* Ridl.
Tedania rubra	*Tedania digitata* var. *rubra.*
Tedania tenuispina	*Stylotella agminata* Ridl.+.

Sideroderma navicelligerum (descr.)	*Histoderma actinioides* sp. n.
Sideroderma navicelligerum (fig.)	*Polymastia zitteli.*
Sideroderma zittelii	*Polymastia zitteli.*
Esperella ridleyi v. *robusta*	*Mycale ridleyi.*
Esperella ridleyi var. *intermedia*	*Mycale ridleyi.*
Esperella serpens	*Mycale serpens.*
Esperella penicillium	*M.* (*Paresperella*) *penicillium.*
Myxilla jacksoniana	*Lissodendoryx jacksoniana.*
Clathriodendron arbuscula	*Clathriodendron arbuscula.*
Clathriodendron irregularis	***Clathriodendron* (?) *irregularis.*
Clathriodendron nigra	*Raspailia nigra.*
Kalykenteron elegans	*Echinodictyum bilamellatum* Lam.
Kalykenteron silex	*Echinodictyum bilamellatum* Lam.
Clathrissa arbuscula (descr.)	*Clathrissa arborescens* Ridl.
Clathrissa arbuscula (fig.)	*Clathriodendron arbuscula.*
Clathrissa elegans	***Clathrissa* (?) *elegans.*
Clathrissa pumila	*Crella incrustans* Crtr. v. *pumila.*
Clathrissa pumila v. *rubra*	*Crella incrustans* Crtr. v. *rubra.*
Echinonema anchoratum v. *ramosa*	***Echinonema* [*anchoratum*, var.] *ramosa*
Echinonema anchoratum v. *dura*	***Echinonema* [*anchoratum*, var.] *dura.*
Echinonema anchoratum v. *lamellosa*	***Echinonema* [*anchoratum*, var.] *lamellosa.*
Echinonema levis	*Crella incrustans* Cr. v. *levis*(?+).
Echinonema rubra	*Crella incrustans* Cr. v. *levis*(?+).
Clathria macropora	**Crella incrustans* var. *levis* (?+)
Clathria pyramida	*Wilsonella* (?) *pyramida.*
Clathria australis	*Crella incrustans* v. *arenacea* Cr. (?+).
Thalassodendron digitata	**(*Thalassodendron digitata*).
Thalassodendron typica	**(*Thalassodendron typica*).
Thalassodendron rubens v. *dura*	*Clathria rubens*+*Rhaphidophlus paucispinus.*
Thalassodendron rubens v. *lamella*	*Rhaphidophlus paucispinus* +*Clathria rubens.*
Thalassodendron paucispinus	*Rhaphidophlus paucispinus.*
Thalassodendron brevispina	*Rhaphidophlus typicus* Crtr. var. *brevispinus.*
Thalassodendron viminalis	*Ophlitaspongia hispida* Crtr. var. *viminalis.*
Plectispa elegans	***Echinoclathria* (?) *elegans.*

Plectispa arborea	*Echinoclathria arborea.*
Plectispa macropora	***(Plectispa macropora).*
Clathriopsamma lobosa	*Wilsonella australiensis*+.
Clathriopsamma reticulata	*Rhaphidophlus reticulatus.*
Aulena laxa	**Echinoclathria laxa.* (?=*E. gigantea*).
Aulena gigantea	*Echinoclathria gigantea.*
Axinella hispida v. *gracilis*	*Raspailia gracilis*+.
Axinella hispida v. *tenella*	*Raspailia tenella*+.
Axinella aurantiaca	*Axinella aurantiaca*
Axinella inflata	***(Axinella inflata).*
Axinella obtusa	***(Axinella obtusa).*
Spirophorella digitata	***Trachycladus digitatus* (=*Spirophora digitata* Ldf.)+.

List B.—Synonymy of Monaxonid Species wrongly identified by Whitelegge in his Revision of Lendenfeld's "Catalogue"—(omitting Chalininæ).

Reniera australis(53, p.324)	*Reniera* sp.
Halichondria mammillata(56, p.282)	*Siphonochalina* sp.
Halichondria clathriformis(56, p.282)	*Chalina finitima* Whtlg. (non Schmidt).
Reniochalina stalagmitis (56, p.283)	*Axiamon folium* g. et sp.n.
Reniochalina lamella(56,p.283)	*Axiamon folium* g. et sp.n.
Echinonema anchoratum var. *ramosa*(54, p.81)	*Clathriodendron arbuscula* Ldf.
Echinonema anchoratum var. *dura*(54, p.81)	*Clathria*(?) *indurata*, sp.n(18).
Echinonema anchoratum var. *lamellosa*(54, p.82)	*Clathria spicata*, sp.n (18)*
Thalassodendron typica (54,p. 86)	*Echinodictyum bilamellatum* Lamk.
Thalassodendron rubens var. *dura*(54, p.87)	*Rhaphidophlus paucispinus.*

*On one page of my former paper(p.211) I have inadvertently referred to this species as *C. diechinata*, a name merely which it was at first my intention to bestow on the species.

Thalassodendron viminalis(54, p.87)	*Echinochalina intermedia* Whtlg.
Plectispa elegans(54, p.90)	*Echinoclathria arborea* Ldf.
Plectispa arborea(54,p.89; 55, p.212)	*Clathria multipes*, sp.n.(18).
Plectispa macropora(54, p.89)	*Echinoclathria ramosa*, sp.n.(18).

New genera have been established as follows:—*Hemitedania*, for *Rhaphisia anonyma* Carter; *Axiamon*, for *Reniochalina lamella* Whitelegge (non Lendenfeld); *Pseudotrachya*, for *Sollasella hystrix* Topsent; *Stylissa*, for *Stylotella flabelliformis* Hentschel; and *Axinosia* (with *Axinella symbiotica* Whitelegge, as type) to include *Stylotella irregularis* Kirkpatrick. *Amorphinopsis* Carter and *Papillissa* Lendenfeld have been revived—the latter provisionally as a subgenus of *Cliona*. *Plectodendron* Lendenfeld, is found to be identical with the almost forgotten *Caulospongia* Kent, and *Strongylophora* Dendy, to be a synonym of *Petrosia*. The genera *Sollasella* and *Stylotella*(s.str.) are removed from the family Axinellidæ and placed in the Donatiidæ and Suberitidæ respectively.

For convenience of reference, I deal with the species in the same order and under the same names and family headings as in the Catalogue.

Revision of the Species.

Familia TETHYDÆ (= Donatiidæ).

Genus Tethya (= Donatia).

Of the difficulties which the identification of many of the species to be revised has presented, the greatest by far, from the point of view of the expenditure of time they have occasioned, have been those in connection with the several species of *Tethya* (i.e., *Donatia*). In the first place, it was found that the specimens labelled as the types of these species, excepting only *T. inflata*, comprise in each case examples of two or three species (or varieties)—among them, in the case of *T. corticata* and *T. lævis*, being examples even of the genus *Tethyorrhaphis* (which outwardly are hardly to be distinguished from the accompanying

specimens of *Donatia*). And, secondly, the examination of all these specimens (some thirty in number), as well as many other examples of the genus from Port Jackson and its vicinity, resulted in my failure to discover any which accorded at all satisfactorily with the description of any one of the species. As a consequence, since it is practically certain that, with the scarcely to be doubted exception of *T. multistella*, all the species in question are comprised amongst the specimens I have examined, I have deemed it best to regard definitely as the types of these species in each case—*T. multistella* excepted—those of the specimens labelled as representing them which best accord with their respective descriptions.

I have found the number of the rays of the spherasters to be very constant in specimens of the same species, and have, therefore, attached importance to it as a specific character. The precise number of the rays not being exactly determinable (owing to their distribution over the surface of a sphere), I have stated, in the following descriptions, only the number of them that can actually be seen and counted.

Tethya multistella.

The "types," labelled as from Port Jackson, comprise three distinct forms, which all resemble *Tethya multistella* in having the surface subdivided into polygonal areas by pore-grooves, but not one of which admits of being identified with either of the varieties into which Lendenfeld divides the species. Some further specimens, left by Lendenfeld and exhibiting a tessellated surface, occur in the collection, labelled (wrongly so far as the specific name is concerned) "*Tethya fissurata*, Port Molle"; and these likewise are unidentifiable with *T. multistella*. As Lendenfeld records the species from Port Jackson, Port Phillip, Port Chalmers, and the Chatham Islands, it accordingly seems probable that his description of it was based solely on specimens from one or other of the last-mentioned three localities, and that the specific identity of the Port Jackson specimens with these was merely assumed from their external resemblance thereto. It is not unlikely that the true types of *T. multistella* are in the

British Museum; though among the sponge-fragments which have been received from that Institution none labelled as *T. multistella* are included.

The following brief descriptions of the several forms above mentioned—which on account of their surface-tessellation and their spiculation, could, I suppose, be designated varieties of *Donatia lyncurium*—are intended merely for the purpose of indicating the chief reasons against the acceptance of any of them as an example of the species here in question.

i. This sponge, which is a common one in Port Jackson and adjacent localities in shallow water, is represented by a number of specimens. The spicules of the radial fibres are styli, which are generally sharp-pointed, and attain a size of about 1250 by 16 μ; the terminal spicules of the fibres project only a slight distance beyond the surface. Between the fibres in the outer region of the choanosome, fairly abundant radially directed slenderer megascleres occur, and in the spicular "nucleus" of the sponge are found comparatively short styli, some of which are less than 200 μ in length. Spherasters occur only in the cortex, and are comparatively very scarce even there; they are at most 45 μ in total diameter, and are provided with straight, conical, smooth rays, the length of which may attain to three-fourths the diameter of the centrum, and the number of which (actually countable) varies from 14 to 18. Tylasters are plentiful in all parts of the sponge, most abundant in the superficial layer of the cortex; they seldom exceed 15 μ in diameter and have the slightly expanded extremities of the rays minutely spined.

ii. A single specimen, labelled as from Port Jackson, is remarkable in having spherasters, the surface of the rays of many of which is roughened with incipient spines; occasionally a few of the spines are of considerable size. In other respects this sponge is very similar to the preceding; but the styli attain a stoutness of 20 μ, and the spherasters a diameter of 55 μ; the length of the rays of the latter may equal the diameter of their centrum; and the tylasters are rare in the choanosome, except in the immediate surrounding of canals.

iii. Another specimen, also labelled from Port Jackson, agrees with those of the two preceding forms in having chiefly stylote megascleres and asters of two kinds; but the spherasters are extremely abundant throughout the entire cortex and occur fairly plentifully also in the choanosome, decreasing in number, however, towards the centre of the sponge. Many of the megascleres are blunt-pointed, and an appreciable number of them approximate in form to (fusiform) strongyla; their maximum size is about 1520 by 22 μ. The spherasters, the largest of which measure 75 μ in total diameter, have from 13 to 17 (actually countable) rays; the rays vary from one-half to three-fourths the diameter of the centrum in length, and are often slightly curved, and occasionally forked, at the extremity. In the choanosome, spherasters of all sizes, from 20 μ in diameter upwards, are common. As regards the tylasters, the same remarks apply as to those of the preceding forms. Radially directed megascleres, lying between the fibres, are not so abundant in this as in the preceding forms, and the surface of the sponge is hispidated by far-projecting spicules.

iv. The specimens labelled "*Tethya fissurata*, Port Molle," differ from the foregoing, and agree with one another, in the following particulars: (1) the megascleres of the fibres, the maximum size of which somewhat exceeds 2000 by 40 μ, are invariably rounded at the apex and are usually almost or quite symmetrically-ended (fusiform strongyla); (2) the megascleres between the fibres are distinctly different from the fibre-spicules (being more or less sharp-pointed at the apex and of much smaller size than them); (3) the chiasters are of two kinds, tylasters and "oxyasters"; and (4) the spherasters have from 19 to 23 actually countable rays. As in the third-mentioned variety, the spherasters are closely packed throughout the entire cortex and occur also scattered in the choanosome. The tylasters, measuring at most 16 μ in diameter, have the ends of the rays slightly expanded and provided with minute spines. The asters of the third kind attain to 23 μ in diameter, and have comparatively slender rays which are not expanded at the extremities, and which usually are blunt-pointed and provided along their whole length with not

numerous minute tubercles or spines; a few, however, have the rays sharp-pointed and free from spines (oxyasters). In spite of their many points of resemblance, the specimens nevertheless exhibit certain decided differences, the most noteworthy of which is in regard to the size of the spherasters; these attain a diameter of 100 μ in one specimen, only 65 μ in another, and are of intermediate size in a third.

Tethya corticata.

According to its description, this species is characterised by an irregularly conulated surface (apparently not incised by pore-grooves), obtusely pointed styli of two sizes, the larger of which attain a size of 2000 by 13 μ, and microscleres of only two kinds, spherasters and tylasters, the former abundant in the cortex. The specimens indicated to be the types, however, as well as a fragment labelled *Tethya corticata* from the British Museum, while conforming fairly well with the description as regards external features, have mostly sharp-pointed styli, the largest of which measure 1600 by 28 μ, only moderately few spherasters, and, in addition to (chiefly cortical) tylasters, abundant choanosomal oxyasters, which are well distinguished from the tylasters both in shape and size. They are, in fact, examples of a variety of *Donatia ingalli*, differing in no essential respect from the specimens labelled (correctly, I feel sure) as the types of *Tethya lævis*, except that in several of the latter, apparently merely in consequence of individual variation, the megascleres which lie free in the choanosome are notably of smaller size than those which compose the fibres. One may, therefore, regard *T. corticata* as synonymous with *T. lævis*, and since the latter name rests on a more certain identification than the former, it should be preferred, and the sponge known as *Donatia ingalli* var. *lævis*.

Tethya fissurata. (Plate xv., fig.3).

In addition to the several specimens referred to above in connection with *Tethya multistella*, the "types" of *Tethya fissurata* comprise two specimens which are unquestionably to be identified with this species; yet, strangely, instead of being as the description states "irregularly spherical, more or less kidney-shaped

sponges, with a flat base," they are stipitate, with a spherical body (in each specimen about 40 mm. in diameter), and with a well-developed, fairly stout stalk which divides below into a number of root-like processes (Plate xv., fig.3). They correspond exactly with the description with respect to surface-features, as may be seen from the figure which I furnish of one of them; and they also show considerable agreement in other respects. The description, however, makes it appear as if only one form of aster, a small tylaster, was present in addition to spherasters, whereas an oxyaster is also present; but Lendenfeld mentions that "a great abundance of the young stages of the larger kind of stellate is to be found," and I, therefore, take it that he mistook the oxyasters for developmental forms of the spherasters. A more correct account of the spiculation is as follows :—

The spicules of the radial fibres are almost exclusively fusiform strongyla with one extremity (viz., the outwardly directed) somewhat narrower than the other, and attaining a maximum size of about 4000 by (rarely) 80 μ; the terminal spicules of the fibres, however, which project beyond the surface, are usually more or less sharp-pointed and are not so large as the others. Between the fibres, megascleres (styli and strongyla) of smaller size occur, but are rare.

The spherasters are incompletely differentiated into two kinds: (1) a relatively shorter-rayed, ranging in total diameter from about 45 μ to upwards of 160 μ, and having from 13 to 18 actually countable rays of length seldom exceeding (and when least, only about two-thirds) the diameter of the centrum—the number and relative length of the rays decreasing as the size of the spicule increases; and (2) a relatively longer-rayed, ranging in diameter from less than 75 μ up to 240 μ, and having from 10 to 14 countable rays, the length of which is greater than (and occasionally attains to twice) the diameter of the centrum. The former occur only in the cortex, and in some parts of it are abundant throughout its entire thickness; the latter are chiefly confined to the choanosome, where they are extremely abundant in the peripheral layer and gradually diminish in number towards the centre. Frequently in the case of the longer-rayed spherasters, and ex-

ceptionally in the case of the shorter-rayed, one to several of the rays are forked, or are once or (seldom) a few times branched, or, on the other hand, are truncated and rounded off at the extremity.

The tylasters, which form a dense layer in the superficial part of the cortex and are scattered sparsely through the choanosome, are at most 19 μ in diameter, and have short stout rays, about equal in length to the diameter of the centrum, with slightly expanded extremities tipped with numerous minute spines.

The oxyasters occur abundantly in all parts of the choanosome, but are absent from the cortex. They attain to 50 or 55 μ in diameter, and have only a very slightly developed centrum and from 6 to 8 slender, usually blunt-pointed rays, generally provided with a few minute spines or tubercles, especially towards their extremities.

Many large spherical embryos occur throughout the sponge, some of which are over 2·5 mm. in diameter. These have radially arranged stylote megascleres and, as microscleres, a very thin superficial layer of tylasters similar to those of the adult, and exceedingly minute developmental spherasters scattered sparsely in the cortex.

Lendenfeld records the species from Port Molle (Queensland), Port Jackson, and New Zealand. The specimens described by me are labelled as coming from Port Jackson.*

If this species is to be placed in the genus *Donatia*, as at present seems necessary, then the latter can no longer be defined as being "without highly specialised pore-bearing grooves."

The sponge described by Hentschel(19) from Shark's Bay (Western Australia) as *Donatia fissurata* var. *extensa*, is undoubtedly a distinct species from the above.

Tethya inflata.

According to description, this species has a smooth (*i.e.*, non-tessellated) surface with thread-shaped appendages, cylindrical

* The Federal trawling-steamer "Endeavour" has now obtained another specimen from Storm Bay, Tasmania.

stylote megascleres 2000 by 14 μ in size, and asters of two kinds —spherasters 50 μ in diameter and tylasters 12 μ in diameter— which are "particularly abundant in the skin"; the colour of spirit-specimens is stated to be light flesh-colour in the cortex, and dirty-yellow in the interior. In agreement with this description, the two specimens labelled as the types have a smooth surface—which in one case is quite even, in the other, slightly tuberculate—and although without filaments and without a pinkish tint (their colour being pale creamy on the surface and brownish-yellow in the interior), yet at any rate they are identical in all other respects with specimens in the collection which exhibit those features. But, contrary to the description, they have fusiform, usually blunt-pointed (occasionally strongyla-like) megascleres, the largest of which are 27 μ in stoutness and less than 1700 μ in length: the spherasters are (comparatively) scarce in the cortex and attain a diameter of 60 μ or more; the tylasters are usually not less than 15 μ (and at most are 20 μ) in diameter; and oxyasters are present. The specimens are, in fact, forms of *D. ingalli* var. *lævis*; and a fragment labelled *Tethya inflata*, from the British Museum, is another example of the same. As I do not think that any reliance can be placed upon the spicule-measurements given by Lendenfeld, or even upon the form which he ascribes to the megascleres, I would, therefore, have but slight hesitation in declaring *Tethya inflata* to be synonymous with *Tethya lævis*, were it not for the fact of the possession by these specimens of oxyasters, and of the comparative non-abundance of their spherasters. I might mention, however, that, in the larger of the two "type-specimens," the oxyasters are rather few in number, and in places are absent (or almost so) throughout considerable tracts; while, at the same time, they are rarely more than 30 μ in diameter, and usually are not very markedly different from the largest tylasters; and thus it is conceivable, in the case of such a specimen, that these spicules could, through hasty observation, be overlooked. Also I might mention that, in some specimens of *Tethya lævis*, the spherasters are abundant in the outermost layer of the cortex; and possibly it is only to the outermost layer of the cortex that Lendenfeld refers in speaking of

"the skin" of the sponge. Accordingly, taking everything into consideration, I think one is justified in regarding *Tethya inflata* (like *T. corticata*) as a synonym of *D. ingalli* var. *levis*.

Tethya phillipensis. (Plate xv., fig.4).

Two of the three specimens labelled as the types of *Tethya phillipensis*, although by no means closely in accord with the description of this species, yet exhibit so many analogies therewith as regards both external and skeletal features, that one is justified, I think, in accepting them as the types of the species. The third specimen, while perhaps more closely in agreement with the description in the matter of skeletal characters, differs from the other two in surface-features, and provisionally I do not regard it as belonging to the same species as they. The locality of all three is given as Port Phillip, and this is confirmed, as regards the two taken to be the types, by the occurrence of a similar sponge in a collection from Port Phillip presented to the Australian Museum by the late Mr. J. Bracebridge Wilson. The following brief description, based on the two type-specimens and the one last-mentioned, will be sufficient to show that *T. phillipensis* is well distinguished from any other of the forms of *Donatia* herein described: and, at present, I consider it to be an independent species. As contrasted with *D. ingalli*, to which it makes nearest approach in spiculation, its chief diagnostic features are the minute pattern of the surface, the presence of (a few) spheres in addition to asters of three kinds, and the plentiful occurrence of spherasters in the choanosome.

The sponge is of more or less globular shape, either sessile (and then at times somewhat depressed) or prolonged below into a short stalk-like portion (*i.e.*, somewhat pyriform). The oscula are conspicuous and several in number. The colour in alcohol varies from a pale creamy-white, with a tinge of pink, to a light salmon. The surface, which is fairly regularly tuberculate, shows over its entire extent a minute reticulation (just visible to the naked eye): the tubercles are usually much depressed, flattened, and the surface as a consequence presents a slightly tessellated appearance. The shallow and, for the most part, narrow grooves

separating the tubercles are not of the nature of specialised pore grooves; immediately underlying these grooves, however, and roofed over only by membrane, are narrow cleft-like spaces in the cortex, so that if a thin superficial layer of the sponge were pared off, the surface then would appear imperfectly divided into polygonal areas by discontinuous narrow cracks. The characteristic minute reticulation of the surface (Plate xv., fig.4) is found, on microscopical examination, to consist of polygonal or rounded meshes, averaging 150 μ in diameter, separated by narrow partitions in which are spherasters and megascleres, the latter—directed perpendicularly to, and slightly projecting beyond the surface—being the terminal spicules of the branches into which the radial skeletal fibres divide on entering the cortex. Superimposed upon this reticulation, and immediately external to it, is a finer reticulation with meshes about 25 μ in average diameter, which meshes are formed by pauciserial lines of tylasters and enclose each a single pore.

The spicules composing the radial fibres are styli, which, almost without exception, are more or less blunt-pointed—occasionally to such an extent as to approximate in form to strongyla; their maximum size in the several specimens varies from 1425 by 20 μ to 1600 by 24 μ. In the cortex, as the fibres approach nearer to the surface, their megascleres gradually diminish in size, and become cylindrical and abruptly sharp-pointed; the smallest of these terminal spicules are less than 240 μ in length. Between the fibres, in the choanosome, a fair abundance of radially directed megascleres occur, which are similar in form to those of the fibres, except that a few of them are slenderer and usually gradually sharp-pointed.

The microscleres are spherasters, spheres, tylasters, and oxyasters. The spherasters are abundant throughout the choanosome, and, in the cortex, occur chiefly in a broad superficial layer; they have rarely less than 13, and normally not less than 9, actually countable rays, and measure at most 65 μ in diameter; when, as occasionally happens, the number of rays is less than nine, it is because of the non-development of one or a few rays, and the spicule is then no longer centro-symmetrical. The

spheres, which are equal in size to the centrum of the spherasters, occur sporadically both in the choanosome and the cortex; though few in number, they are not so rare as to excuse their being overlooked; in rare instances, two or three spheres may occur fused together.

Although similar to one another in all the foregoing particulars, the specimens are nevertheless of two forms in respect of a number of other (spicular) characters. In one form, (i.) the rays of the spherasters are rarely or never as long as (and usually are somewhat less in length than two-thirds) the diameter of the centrum, and not infrequently one or a few of them are provided with a small spine or two (incipient branches), or are forked at the extremity; (ii.) the tylasters, which may attain to 19 μ in diameter, have short stout rays usually less in length than the diameter of the centrum and provided with a well-developed terminal knob densely covered with minute spines; and (iii.) the oxyasters, which vary from (seldom) 20 μ to 35 μ in diameter and are fairly abundant, have moderately stout rays (1·5 to 3 μ in diameter near their base) with the distal half of their length covered with well-developed tubercles. In the other form, (i.) the rays of the spherasters are generally as long as, or slightly longer than, the diameter of the centrum, and rarely (if ever) exhibit incipient branching; (ii.) the tylasters are at most 17 μ in diameter, and have comparatively slender rays, which are longer than the diameter of the centrum, and are usually only slightly knobbed, and which are provided with spines, not only around their extremity, but also for some short distance along their length; and (iii.) the oxyasters, which are of about the same diameter as those of the preceding form, have slender rays only sparsely provided with tubercles.

Remarks.— Among the fragments received from the British Museum, there is one labelled *Tethya phillipensis* which, in skeletal characters (excepting that the spherasters are at most only about 55 μ in diameter), is in various respects intermediate between the two above-described forms. Unfortunately this fragment was used up in the preparation of sections from it,

without a proper examination of its surface-features having been made; but if the specimen, from which it was taken, exhibits the characteristic dermal reticulation that would prove it to be also a form of *Donatia phillipensis*, then I would be inclined to say that a separation of these forms, as distinct varieties, is not feasible.

The specimen referred to in the opening paragraph, which I do not consider to belong to *D. phillipensis*, differs from the type-specimens of that species chiefly in the absence of a dermal reticulation and of subdermal clefts in the cortex, and in almost all respects is closely similar to *D. ingalli* var. *lævis*. In it, however, just as in *D. phillipensis*, spherasters are abundant in the choanosome and spheres are present. Concerning its megascleres, exactly the same remarks apply as to those of *D. phillipensis*, excepting that the largest attain a length of 1670 μ. The spherasters have from 9 to 13 countable rays, the length of which is less than the diameter of the centrum, and which rarely (if ever) exhibit any tendency to branch. Spherasters with one or more rays completely aborted were not observed. The tylasters are rarely more than 16·5 μ in total diameter, and their rays, which are shorter than the diameter of the centrum, have well-developed terminal knobs densely covered with minute spines; an extremely few, however, ranging in diameter from about 16 up to about 23 μ in diameter, have the rays less markedly knobbed, and provided with spines for some distance along their length. The oxyasters, which are abundant, occasionally attain to 43 μ in diameter, and have, as a rule, stout rays (2 to 4 μ in diameter at the base), the distal half of the length of which is covered with well-developed tubercles; some of the more slender-rayed spicules (? developmental forms), however, are without tubercles; in a small proportion of cases, the rays, which in such instances are usually stunted, are provided along their whole length with tubercles, and the spicule then often closely approaches in form to the oxyasters of *D. ingalli* as figured by Bowerbank (**3**, Pl. v., fig. 17). In no other example of *Donatia* examined by me, does the tuberculation of the rays of the oxyasters reach quite such a degree of development.

Tethya lævis.

The sponge, which I identify as *Tethya lævis*, is a common one in the neighbourhood of Port Jackson, and is represented in the Australian Museum by some dozens of examples. The specimens labelled as the types of *Tethya corticata* and *Tethya inflata*, as well as the fragments labelled with the same names from the British Museum, are, as already stated, examples of it; and it is represented (along with several examples of *Tethyorrhaphis lævis*) among the specimens labelled as the types of *Tethya lævis*. There can be no doubt, also, that the species is identical with the *Tethya ingalli* recorded from Port Jackson by Sollas(**36**); but as proof is yet lacking of its strict identity with Bowerbank's species of that name, the locality of which is Western Australia, I propose to regard it as a variety thereof, and to designate it *D. ingalli* var. *lævis*.

The sponge, which appears always to be more or less spherical in shape, and to grow attached to the substratum by root-like processes, is chiefly distinguished, so far as external features are concerned, by the entire absence of any sign whatsoever of surface-tessellation, and by the very small size of the oscula,—the latter being, as a rule, at any rate in the case of preserved (and contracted) specimens, almost or quite invisible. The pores are not discernible; and there is no perceptible minute reticulation of the surface as in *D. phillipensis*. The surface is mammillated, the elevations varying in shape in different specimens, or even in different parts of the same specimen, from low and dome-like to verruciform; in most specimens, a certain proportion of these elevations are provided apically with a thread-like process, at the extremity of which a bud is often to be observed.

The two previous accounts of the sponge are not quite full and accurate concerning its spiculation, more especially in regard to the megascleres. These spicules are imperfectly differentiated into three kinds, the typical representatives of each of which are distinguished not only by their form and size, but also by their different situation in the sponge. The spicules of one kind are chiefly or exclusively confined to the fibres and almost entirely compose them; these attain a maximum length varying between

1·5 and 1·9mm., (but only in rare specimens exceeding 1·6 μ) and a maximum stoutness approximating to 30 μ. The spicules of the second kind, which are typically of much smaller size than the preceding, though connected with them by a perfect gradation, contribute to form a "nuclear" skeleton surrounding the centre from which the fibres radiate, and are found also in the cortex in the penicillately outspread terminations of the fibres; the smallest of them measure less than 275 by 10 μ. Those of the third kind occur between the fibres, chiefly in the more peripheral part of the choanosome, and they vary markedly in size and abundance in different specimens. All three kinds are alike styli, which gradually taper towards the basal end and usually exhibit a faint constriction just immediately above that end: but the first-mentioned, or chief fibral, spicules are fusiform, and almost invariably have the apical end more or less rounded off so as occasionally to approximate in form to strongyla; the second are nearly cylindrical in shape, and are more or less abruptly sharp-pointed; while those of the third kind taper gradually to a usually very fine point. As already stated, the last-mentioned spicules are subject to considerable variation in size and number. Thus in one specimen (which is to be regarded as strictly typical of the var. *lævis*) these spicules are very few in number and rarely exceed 600 by 6 μ in size; whereas in most of the specimens labelled by Lendenfeld as the types of *Tethya inflata* and *Tethya corticata*, they are, on the other hand, extremely abundant and about equal in size to the spicules composing the fibres. Other specimens which I have examined are less widely divergent in these respects, and at present (although further investigation is necessary in order to settle the point) I do not think that the differences in question are varietal, more especially as they do not appear to be associated with any constant differences in respect of other characters.

The spherasters are almost entirely confined to the more superficial part of the cortex, and to the outermost region of the choanosome adjoining the cortex; the largest have a maximum diameter varying in different specimens from 60 to 85 μ; the rays, which in length are about equal to the diameter of the

centrum, are rarely if ever bifurcate or branched, and their number (actually countable) varies (in the same specimen) from 9 to 13. The chiasters (tylasters) form a very thin layer at the surface of the sponge and are scattered through both the cortex and the choanosome – more abundantly in the former region, especially in the immediate surrounding of the canals traversing it; they measure from 10 or 11 μ up to from 17 to (rarely) over 20 μ in diameter, have from 6 to rarely more than 10 moderately stout rays, which are provided with a well-developed terminal knob covered with minute spines, and exhibit a fairly well-marked centrum, the diameter of which may equal or even slightly exceed the length of the rays. The oxyasters are entirely confined to the choanosome, are usually abundant, and vary in maximum diameter in different specimens from about 30 to slightly upwards of 40 μ; they have from 5 to 9 rays, which are provided over their distal moiety with tubercles, some of which are elongated so that the rays may appear branched.

Loc.—Port Jackson.

Genus Tethyorrhaphis.

According to their description, the four species, ascribed by Lendenfeld to this genus, are distinguished both by differences in the shape and degree of development of protuberances on the surface, and by a number of points of difference in spiculation. Thus, in the case of *T. lævis* and *T. gigantea*, the brushes, formed by the skeletal fibres on approaching the surface, are stated to be lacking in the shorter stylote spicules present in the other species; in the same two species and in *T. conulosa*, asters of two kinds, spherasters and chiasters, are mentioned as occurring, but in *T. tuberculata* only chiasters; and the peculiar microscleres characteristic of the genus are described as strongylote in *T. lævis*, simply as "diact" in *T. tuberculata*, and as oxeote in *T. gigantea* and *T. conulosa*. I have examined all available examples (some twenty in number) of the genus, including those labelled as the types of the several species; but I have failed to find any differences among them in spiculation, except as regards the size and relative abundance of the several kinds of micro-

scleres. Considerable diversity, indeed, exists among them in the character of their surface-elevations, these being either few or numerous, and either rounded (varying from wart-shaped to dome-like) or conical (and then sometimes prolonged each into a filament). But the various differences observed are apparently merely the outcome of individual variation.

The labelled specimens, excepting those purporting to represent *T. conulosa* and *T. tuberculata*, are in fair agreement with the description of the species whose name they bear, as regards outward characters, and it is beyond reasonable doubt that they are authentic examples of those species; while among the remaining specimens, there are some which exhibit the external features ascribed to *T. tuberculata*, and others, again, having the surface provided with tapering conical processes, which presumably are to be identified with *T. conulosa*. Accordingly, I look upon Lendenfeld's four species of *Tethyorrhaphis* as representing but a single species, which we may call *Tethyorrhaphis lævis*.

In every respect, *Tethyorrhaphis lævis* resembles a species of *Donatia* except in possessing, in addition to asters, microscleres in the form of small blunt-ended rods (microstrongyles) densely covered with minute spines, and along with these a number of forms variously intermediate between them and chiasters. Asexual propagation, by means of buds, occurs, and in the same way as in *Donatia*. The superficial appearance of the sponge, owing to the absence of any trace of pore-grooves, approaches at times very closely to that of *T. ingalli* var. *lævis*; and, in some cases, microscopical examination is necessary before one can say with certainty to which of the two species a given specimen belongs.

The spicules composing the radial fibres within the choanosome are blunt-pointed, fusiform styli, frequently almost or quite symmetrically ended (*i.e.*, strongyla); their maximum size varies in different specimens from 1850 by 30 μ to 2300 by 38 μ. Near the surface of the sponge, the fibres expand penicillately, and their fusiform spicules are there largely replaced by shorter, abruptly sharp-pointed, and more cylindrical styli of various lengths down to 280 μ or less. Spicules similar to the latter

occur also, abundantly, disposed concentrically around the centre from which the fibres radiate, forming a well-marked spherical "nucleus" to the sponge. Between the fibres elsewhere, megascleres are rare or absent. The spherasters are found chiefly in the outer region or the cortex, and in the peripheral layer of the choanosome close beneath the cortex; they are provided with, usually, from 11 to 15 actually countable rays, and vary in their maximum total diameter, in different specimens, from about 50 to 90 μ. It appears to be the rule that, in specimens in which the maximum diameter of the spherasters is less than 70 μ, the rays, for the most part, are shorter than the diameter of the centrum, and frequently are bifurcate at the extremity; whereas when the spicule is of greater diameter than 70 μ, the rays appear usually to be longer than the diameter of the centrum and to be only very rarely forked. The chiasters (which are almost entirely confined to the choanosome) are sometimes abundant, sometimes rather scarce; they usually have from 6 to 10 rays, the surface of which is minutely tuberculate. The diameter of the chiasters that occur in the cortex rarely exceeds 12 or 13 μ, while those within the choanosome range in diameter up to 18 or 20 μ; also, in the case of the smaller chiasters, whether in the cortex or the choanosome, the rays usually are slightly expanded at the tip, whereas the larger ones approach more closely in form to oxyasters, and, in addition, they occasionally exhibit a branching of their rays; there would thus appear to be an incipient differentiation of the chiasters into two forms, tylasters and oxyasters. As intermediates between the chiasters and the microstrongyles, somewhat plesiaster-like forms are commonly met with, in which the rays proceed, not from a common centre, but from a shorter or longer axis, and are usually also reduced in number. In addition to these, triradiate or Y-shaped forms are frequent, as well as bent rods derived from the latter through the loss of one ray. The microstrongyles occur in moderate abundance throughout the entire cortex and are densely aggregated to form a thin layer immediately below the surface; they are also scattered through the choanosome, gradually decreasing in numbers towards the centre of the sponge. They vary from 6 to (rarely) 20 μ in

length and up to 3 μ or slightly more in stoutness. In their earliest developmental stages, they have the form of very slender centrotylote amphioxea.

Loc.—Port Jackson.

Familia SOLLASELLIDÆ.

From the description given below, it will be seen that *Sollasella digitata*, the single species on which this family was founded, is unquestionably aberrant, and that it cannot with any justification be retained in the *Axinellidæ*, to which it is generally regarded as belonging. Nor can it be referred to any other of the recognised families as ordinarily defined. In some features, however, it shows a striking similarity to certain *Donatiidæ*. Thus its cortex appears to be exactly similar in character to that of the genera *Donatia* and *Xenospongia*; it further resembles *Xenospongia* and some species of *Donatia* in having inhalant pore-like apertures localised along lines; and, although not possessed of a typically radiate skeleton—being of ramose habit—is provided, externally to the core-region, with a system of fibres which run perpendicularly to the surface, and expand penicillately in the cortex. Accordingly, for the reception of the genus *Sollasella*, either the family *Sollasellidæ* will have to be retained, or the *Donatiidæ* defined in a broader sense; and of the two alternatives, I think the latter has most to recommend it. It is to be noted that, in *Donatia* itself, the skeleton is not completely radiate, since there is present a central core-region in which the spicules have a confused arrangement, and, besides this, the spicules lying between the radial fibres are not always radially directed.

Topsent(47) has referred, to the genus *Sollasella*, the species originally described by him as *Trachya hystrix*. As it now becomes evident that this is a markedly different type of sponge from *S. digitata*, I venture to propose for its reception a new genus, *Pseudotrachya*, to be placed provisionally in the *Axinellidæ*.

Sollasella Lendenfeld.

Donatiidæ(?), typically of ramose habit, with well-developed fibrous cortex and with linearly disposed inhalant openings leading

into chones. Microscleres absent. The megascleres are of two kinds—the larger, monactinal (typically subtylostrongyla); the smaller, diactinal (oxea). The skeleton of the interior, consisting chiefly of longitudinal spicule-bundles and variously oriented scattered spicules, is supplemented in the axial region by a reticulation of fibres composed of a sponginous substance, and in the extra-axial region by radiating spicule-fibres, which continue into the cortex.

Sollasella digitata. (Plate xv., figs.1,2; and text-fig.1).

The species is represented by the incomplete type-specimen (Pl. xv., fig 2), by a correctly labelled fragment from the British Museum, and by an entire specimen (Pl. xv., fig.1) from an unknown locality, probably obtained by the "Thetis" Expedition.

External features. — Sponge ramose, stipitate; stalk and branches short, stout and cylindrical, the latter extending upwards and outwards in various directions without anastomosis. Surface even, very sparsely hispid with singly dispersed long spicules that project 2 or 3 mm. beyond it, and conspicuously characterised by a polygonal areolation formed by lines of uniserially disposed, closely approximated, small shallow pits; these pits are terminated below by a microscopically cribriporal membrane, which roofs over an inhalant chone. The oscula are few, scattered, small; they measure up to 2 mm. in diameter. Consistency very firm, dense, and tough. Colour in alcohol brownish.

In one of the specimens (Pl. xv., fig.2), the surface-areolation is generally hexagonal, the areolæ average between 2 and 3 mm. in width, and the pore-pits, which are usually elliptical in outline, measure from 0·2 to 0·5 mm. in their longer diameter. In the other, the type-specimen, the areolæ are, as a rule, much elongated in the longitudinal direction of the branches, but are very variable in length, and measure only 1 to 2 mm. in width; while, at the same time, the pits are comparatively small, being rarely as much as 0·2 mm. in diameter. Neither of the specimens affords any particular justification for Lendenfeld's statement that the polygonal fields (areolæ) are "expressions of the terminations of the surface-tufts of the spicule-bundles"; nor do

they at all substantiate his statement that these fields "are divided from each other by sharply defined incisions" unless the word "incisions" is used in a quite unusual sense. The two specimens are of nearly the same height, viz., 120 mm., which is 20 mm. less than the maximum height recorded by Lendenfeld.

Internal structure.—A transverse section across a branch permits three regions to be distinguished with the naked eye: (i.) a pale-coloured external layer, or cortex, which, in different parts of the sponge, varies in width from about 0·8 to 1·5 mm.; (ii.) a deeply brownish-coloured subcortical layer, usually much wider than the cortex, but in width rather variable; and (iii.) a broad axial region or core, also brownish-coloured, distinguishable from (ii.) by reason of its being traversed longitudinally by numerous spicule-strands, the cut ends of which show clearly on the surface of the section. In the figure of the type-specimen (Pl. xv., fig. 2) a branch is seen in longitudinal section, showing the relative extents of these three regions. In this example, however, the subcortical tissue has mainly disappeared owing to maceration (which it undergoes more readily than do the other tissues), and, as a result, a system of fibres, crossing the subcortical layer and passing into the cortex, is brought into view. Owing to these fibres, the cortex cannot be peeled off separately, but, in its removal, drags with it most or all of the underlying layer. In a longitudinal section of a branch, ordinarily, the subcortical region is not recognisable as a layer distinct from the core-region (Lendenfeld includes them both under the term "pulpa"); but the demarcation between the subcortical layer and the cortex is well-pronounced, owing to their difference in colour, and to the presence, immediately beneath the latter, of a narrow zone of lacunæ and canals. Lendenfeld's statement that these lacunæ (and canals) form a "nearly continuous cavity" beneath the cortex, appears to be somewhat exaggerative.

On treatment with a macerating agent, such as caustic potash, the two outer layers of the sponge readily soften and come away, leaving intact the stout core, the thereby exposed surface of which bristles sparsely with long spicules projecting, nearly perpendicularly, 1 to 3 mm. beyond it. The core is very resistant

to maceration, but after prolonged treatment, aided by washings with a pipette, it becomes reduced to a reticulation of fibres composed of a substance much resembling spongin, entangled with which, and apparently for the most part independent of it, are numerous indifferently oriented oxea. Many of the apparently free spicules, however, prove, on close scrutiny, to be ensheathed, over portion at least of their length, with a thin layer of spongin continuous with that of the fibres; and the long spicules (subtylostrongyles) which project from the core, are likewise found to be held in position by a partial covering of spongin. The sponginous fibres are not provided with an axial core of longitudinally disposed spicules.

Skeleton.—The skeleton of the axial region consists, in addition to the spongin-reticulation and the irregularly disposed oxea, of ill-defined longitudinal strands of loosely associated oxea and subtylostrongyla. The reticulation of spongin-fibres is exceedingly irregular in pattern, and the fibres themselves are very variable in stoutness and uneven in their outlines. The spongin has a faintly brownish-yellow tint, and is of low refractive index, and is readily stainable.

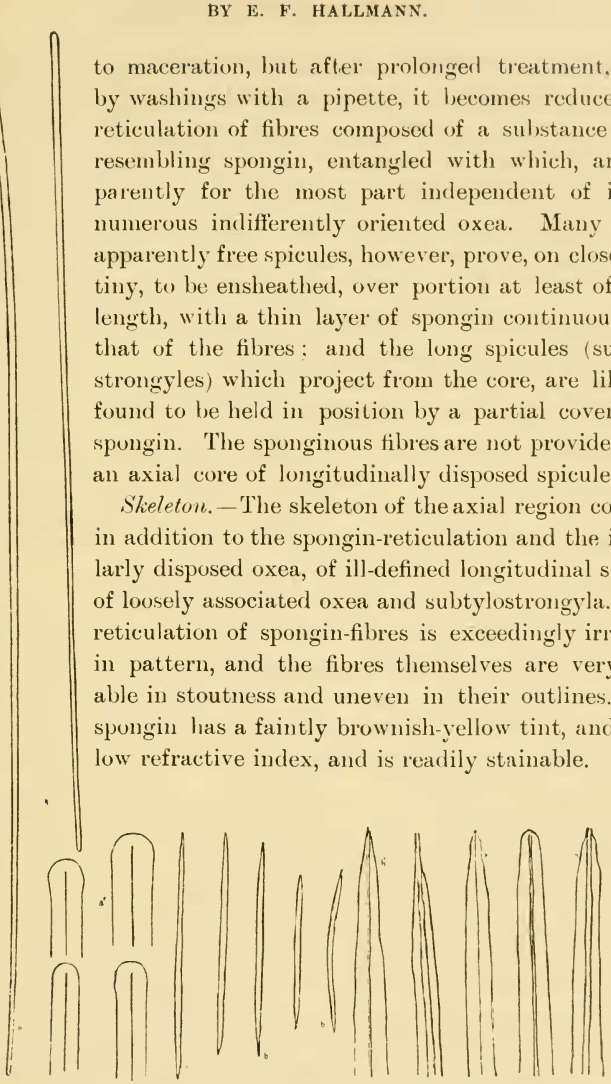

Fig. 1.—*Sollasella digitata*. *a*, Subtylostrongyla. *a'*, Basal extremities of ditto. *b*, Oxea. *b'*, Extremities of oxea.

Immediately surrounding the core-region, and forming the inner limit of the subcortical layer, is a narrow belt of longi-

tudinally disposed spicules, which are chiefly subtylostrongyla. This belt is crossed, at rather wide intervals in a radial direction, by single spongin-fibres, each ensheathing the basal portion of a subtylostrongyle; and immediately external to the belt, the already-mentioned radial fibres, composed of closely packed parallel oxea, take origin, each fibre having, as its axis, one of these radially directed long spicules. The remaining skeleton of the subcortical layer consists of abundant oxea arranged in an irregular, somewhat halichondroid, fashion, even if, for the most part, more or less longitudinally directed.

The radial fibres increase in stoutness on their way across the subcortical layer, and on their arrival at the cortex sometimes exceed 200 μ in diameter. On entering the cortex, each fibre spreads out into a widely divergent brush, the terminal spicules of which project slightly beyond the surface. Apart from the occasional long spicules which project from the surface, these spicule-brushes constitute the entire cortical skeleton.

Spicules.—(*a*) The oxea are very slightly fusiform, mostly straight, and nearly always irregularly ended, very frequently having abrupt, more or less mucronate, sharp points. They vary from about 340 to 760 μ, but are usually between 450 and 650 μ in length, and attain (rarely) to 15 or 16 μ in stoutness. (*b*) The so-called subtylostrongyla are usually only very faintly expanded at the basal end, and often are without any sign of such enlargement; occasionally, however, the phyma is so well developed that the spicule could be called a tylostrongyle. They are nearly always quite straight, taper slightly from base to apex, and vary from (rarely) less than 2 mm. to upwards of 4 mm. in length, and from 10 to 35 μ in diameter measured just above the base. Among the slenderest spicules, there are some which are gradually sharp-pointed at the apex, *i.e.*, are subtylostyli.

Histology. Rounded cells, about 12 μ in diameter, containing brownish granules, occur abundantly in all parts excepting the cortex. The flagellated chambers are confined to the axial region of the sponge, and are of rounded shape, measuring about 25 μ in diameter. The cortex consists of a dense fibrous tissue, resembling that of the cortex of *Donatia*.

Familia SPIRASTRELLIDÆ.

Of the five species of *Spirastrellidæ* described in the Catalogue, one, *Papillina panis*, is a *Spirastrella*, identical partly with *S. papillosa* R. and D., and partly with *S. papillosa* var. *porosa* Dendy; two, *Spirastrella australis* and *Papillina ramulosa*, are, in virtue of their outward form and spiculation, likewise referable to *Spirastrella*, yet exhibit a character apparently not possessed by any other species of the genus; and the remaining two, *Raphyrus hixonii* and *Papillissa lutea*, belong to the genus *Cliona* (*sens. ampl.*). Vosmaer recently(50), after a comprehensive study of the genus *Spirastrella* based on numerous specimens, including the types of many of its described species, has expressed the opinion that, of the thirty-four (excluding the insufficiently described) species known to him, which are referable to this genus, all but two are to be regarded as no more than forms or "tropi" of a single species, *S. purpurea*. Of the three species of *Spirastrella* indicated above, *S. australis* was dismissed by Vosmaer as insufficiently described to admit of an opinion regarding it, and *S. ramulosa* (probably thought by him to be a species of *Cliona*) he does not mention; while *S. papillosa* (more especially its variety *porosa*), although taken into account by him, seems not to have received due consideration. Accordingly, in dealing with these species, even while not intending to furnish a detailed description of them in this paper, it seemed to me necessary that I should attempt to determine, if possible, whether they admitted or not of being specifically distinguished from *S. purpurea* (*sens. ampl.*). At the outset, little hope was felt of arriving at a definite conclusion, inasmuch as Vosmaer allows, in the case of this species, exceedingly wide variation in almost every character that can be utilised for species-differentiation; but though it was found impossible to come to a decision regarding *S. papillosa*, it very soon became evident that *S. australis* and *S. ramulosa* are species quite of a distinct kind; and, indeed, it is only provisionally that I refer them to the genus.

The peculiar and distinctive feature of these two species is their possession of a skeleton consisting in part of a system of exceedingly stout "fibres" which remain intact when the sponge is

macerated by means of caustic potash, and which consist of closely packed spicules held together by what appears to be a kind of connective tissue. A skeleton of similar nature, though of very different conformation, is possessed also by *Cliona hixonii*; but I have so far met with nothing of a like kind in any other of the species of *Spirastrella* that I have examined, nor has such a skeleton been mentioned by Vosmaer.* It would seem not unlikely, therefore, that *S. australis* and *S. ramulosa* are more closely related to *Cliona* than to *Spirastrella*; and the question arises as to what particular features are to be regarded as essentially distinguishing the two genera. To this question, I do not think a satisfactory answer can, at present, be given. The distinction recognised by Vosmaer is summed up in his statement that, "whereas the latter (*Cliona*) begins its post-larval life by boring into calcareous matter, *Spirastrella* never does so"; but although this may ultimately prove of value as a basis for separating the two genera, the fact remains that the life-history of most of the species included in the genus *Spirastrella* is as yet unknown to us. At present, the practical difficulty which presents itself is how to determine, in a given case, whether a massive sponge seemingly a *Spirastrella* has or has not been in early life a boring sponge; and in striking illustration of this, is the fact that Vosmaer himself has confounded with *Spirastrella purpurea* a species that undoubtedly should be referred to *Cliona*. I refer to *Spirastrella areolata* Dendy, which in the areolation of its surface and in its possession of spined microxea (apparently overlooked by Vosmaer) shows so close an analogy with *Cliona hixonii* as to render unquestionable the close relationship of the two. There is a number of species also unreferred to by Vosmaer—concerning which it is an entirely open

* I think it is exceedingly probable, however, that *Spirastrella robusta* (Carter) Dendy(14)—which was regarded by Carter as a variety of *Spirastrella cuncatrix*—will be found to possess an analogous type of skeleton. I have seen only a thin section of this sponge—one presented to the Australian Museum by Prof. Dendy—and although this is insufficient to provide unmistakable evidence of the presence of such "fibres," nevertheless the structure of the skeleton, as displayed therein, exhibits, on the whole, a marked similarity to that of *S. australis*.

question whether they belong to *Spirastrella* or *Cliona*; one may mention, for example, *Cliona phallica* Leidy(25), and several species described by Verrill(49), viz., *Heterocliona cribraria*, *Spirastrella mollis*, and apparently also *Polymastia varia*.

Having examined an undoubted example of *Spirastrella fibrosa* Dendy(14), from the type-locality, I agree with Vosmaer that this species does not belong to *Spirastrella*; I find it to be congeneric with the species described by me(15) under the name *Latrunculia conulosa*.

Spirastrella australis. (Pl. xv., fig.5; Pl. xvii., fig.3).

The species is well represented in the collection, both by a number of the original specimens and by others more recently obtained; among the latter, there is a single small one which differs from the rest in being of submassive form. The chief distinguishing characters of the species are its typically compressed plate-like form, its smooth and even surface without tubercles or papillæ, and the density and compactness of its substance; in addition to these, but becoming manifest only when the sponge has been macerated, is the reticulation of stout cord-like "fibres" forming the main skeleton. An adequate idea of the conformation of this skeleton may be obtained from the figure (Pl. xvii., fig.3). Apart from being lamellar, the sponge is without definite habit; occasional specimens are more or less regularly flabelliform. Contrary to the description, apparently in no case do oscula occur on either of the flattened surfaces of the sponge, but only along its margin; and these are of minute size. Lendenfeld's description of the canal-system, also, appears to me to be quite without value.

In thin sections cut transversely through the entire thickness of the sponge, the naked eye can distinguish (i.) a less compact middle region within which are denser areas corresponding to transected "fibres," and, on either side of this, (ii.) a more compact superficial layer of mottled appearance (because not uniformly dense), which extends to the surface and has a width of 1-2 mm. Under the microscope, the demarcation between these regions is indistinct, and what difference there is, in their appearance,

seems mainly to be due to differences in the closeness of aggregation of the spicules, and particularly of the microscleres, the abundance of which, throughout all parts of the sponge, constitutes a marked characteristic of the species.

The tylostyli are straight non-fusiform spicules, very gradually tapering throughout the greater part of their length, and, as a rule, terminating in a sharp point; their length ranges from (rarely) less than 390 μ to 610 μ, while the stoutest of them are 11 μ or 12 μ in diameter. The spirasters are separable into two groups: (i.) those which occur in great abundance throughout the whole interior, and (ii.) those which are almost exclusively confined to a very thin superficial layer of the sponge. The former are stout, with a straight axis, and with close-set large spines, which are not uncommonly as much as 20 μ in length, and are frequently more or less curved in the manner of a rose-thorn; inclusive of spines, these spicules measure 35 μ to 60 μ in length, by 30 μ to 55 μ in breadth. The spirasters of the second group, which are usually of much smaller size than the preceding, are very variable in form, and perhaps are divisible into several kinds; of chief importance concerning them, however, is the fact that they include forms much resembling the "lophasters" of *Timea lophastræa* Hentschel(**19**), as well as forms intermediate between such and spirasters of more typical shape.

Loc.—Port Jackson.

Papillina panis.

In connection with this species, a difficulty presents itself which, in spite of the fact that over a dozen specimens (all labelled as *Papillina panis* by Lendenfeld) are at hand, cannot be solved until additional material is forthcoming. The specimens, while extremely alike in all other essential respects, are in some cases provided with small oscula, in others instead with one or several sieve-areas; in no observed instance do both oscula and sieve-areas occur in the same specimen. So far as I can see, if there is another difference between the two forms, it lies in this, that, generally speaking, the oscula-bearing specimens are rather of conical or wedge-shaped form, while the sieve-bearing

specimens are low and broad, or (less frequently) more or less compressed into plate-like form, and have a flattened upper surface. In both forms, the oscula or the sieve-areas, as the case may be, occur on the upper aspect of the sponge. There can scarcely be any doubt that the form with oscula is identical with *Spirastrella papillosa* Ridley and Dendy, although the oscula are very much smaller than in the type of that species; while it is equally certain that the form with sieve-areas is identical with *S. papillosa* var. *porosa* Dendy(14) from Port Phillip. What I cannot decide is whether we have to do with a single form or with two distinct forms.

The sieve-areas, which measure several square inches each in extent, are free from the tubercles that occur in other parts of the surface, and are usually slightly depressed below the level of the surrounding surface; they are perforated by close-set circular pores (measuring from 75 μ to 160 μ in diameter, and between 100 μ and 200 μ in distance apart), and thus present an appearance very much resembling that of the pore-bearing surface of certain polyporaceous fungi (e.g., *Polystictus*). Possibly it is to these sieve-areas that Lendenfeld refers, when he speaks of "movable membranes" by which "for the most part" the "vents" are covered; but it is strange that he makes no reference to their perforate or sieve-like character. The "perforated membranes," or "inhalant pore-sieves," which he mentions as occupying the depressions between the papillæ, are different, and correspond to what is described by Dendy (*loc. cit.*) as a "beautiful pore-bearing membrane" stretched between the "conuli." This membrane has a minutely reticulate appearance, which, in some specimens, is very distinct, in others scarcely perceptible; but it is not, to the naked eye or even with the aid of a lens, "perforate" or "porous" in the sense of "sieve-like."

As far as I know, oscular sieve-areas in the genus *Spirastrella* have been observed only in *S. papillosa* var. *porosa*. Vosmaer makes no mention of the occurrence of anything of the kind in any of the numerous forms of *Spirastrella* studied by him; nor, by the way, does he comment upon their occurrence in *S. papillosa* var. *porosa*—an omission difficult to account for, since he

quotes this sponge in support of his reasons for regarding *S. papillosa* and *S. cunctatrix* as identical. There is good reason to believe, therefore, that *S. papillosa* var. *porosa*—even though it should prove to be merely a variant of *S. papillosa* – belongs to a species quite distinct from any other that Vosmaer would include under *S. purpurea*: as we have yet no proof that it and *S. papillosa* are connected by intermediate forms, and as the distinction between the two seems so definite, I am inclined to regard it as at least an independent variety.

Seeing that Vosmaer considers that no importance can be attached to the presence or absence of papillæ as an indication of specific difference, I may mention that every specimen of *S. papillosa* and of its variety I have seen, is not only provided with papillæ, but these always have the same characteristic appearance, and are always distributed over all parts of the surface except in the neighbourhood of the oscula or upon the sieve-areas. There may be considerable variability in the degree of development of these papillæ as regards their size, but scarcely any as regards their relative number; when least pronounced, they resemble those of the specimen figured by Vosmaer (Pl.iii., fig.5). Besides *S. papillosa*, I am acquainted with at least five that I believe to be quite distinct species of *Spirastrella*, and, in the matter of papillæ, no specimen of these makes any approach to *S. papillosa*.

The character of the papillæ in *S. papillosa* is such as to suggest that they are morphologically related to the papillæ and areolæ of *Cliona* (*Papillissa*) *lutea* and its allies; because of this, I am inclined to attach importance to the fact that, in many specimens, both of *S. papillosa* and of its variety, I have found incorporated, pieces of shell and other calcareous fragments which, in every case, showed the characteristic perforations due to a boring sponge.

It remains to be mentioned that, in connection with the two figures given in the "Catalogue"(Pl. i., figs.1-2), which purport to be in illustration of *Papillina panis*, a serious mistake has been made: the first is unmistakably a figure of *Cliona* (*Papillissa*) *lutea*, and the second is one of *Spirastrella*(?) *ramulosa*.

Papillina ramulosa. (Pl. xxii., fig.5).

In addition to the type-specimens, five in number and well-preserved, another example of the species (correctly labelled) is included among the fragments received from the British Museum.

As I already have had occasion to mention, a figure of a specimen of *Spirastrella*(?) *ramulosa* is given in the Catalogue (Pl. i., fig.2), but is wrongly indicated as being one of *Papillina panis*. In regard to the external features of the species, the original description may stand without amendment, except in one particular: the small circular openings scattered over the surface are not oscula, as Lendenfeld has stated, but simply holes due to the presence, here and there beneath the surface, of symbiotic operculate Cirripedes. These openings, then, are of the same nature as those which Lendenfeld also described as oscula in the case of *Cliona lutea*. In view of such an error, indicative as it is of extremely superficial and hasty observation, one need scarcely remark how little is the value to be attached to the statements concerning the minuter details of the canal-system. As in *S. australis*, the whole interior of the sponge, quite to the surface, is very dense, and canals are few and of small size. The largest canals, which run in an ascending direction, are usually very much less than 1 mm. in diameter; they are always easily traceable to immediately beneath the surface of the upper parts of the sponge, and some of them, at least, can be seen to terminate in very minute oscula.

The peculiar "fibres" composing the main skeleton, as revealed in a macerated specimen, are arranged dendritically; owing to their mode of branching, they exhibit a tendency to become restricted in their disposition to a limited number of vertical planes of branching, or, in other words, to be arranged in flabellate systems. They are from more or less strap-shaped to cylindrical, and (in the only specimen in which they were examined, one measuring 120 mm. in height) measure about 1 mm. in stoutness at the base of the sponge, and about 0·5 mm. at its top. Anastomosis between the "fibres" occurs, but it is not very frequent, except in the older portions of the sponge.

Between the "fibres," megascleres are scattered in profusion and without apparent order. Spirasters likewise occur in all parts, but only in moderate abundance (as compared with those of *S. australis*) except at the surface, where they form a dense layer varying in width from about 100 μ to 450 μ.

The tylostyli are typically straight, and are usually more or less rounded off at the apex, so as occasionally to resemble tylostrongyla; the largest vary in length, in different specimens, from 440 μ to 560 μ and are about 11 μ in diameter. The spirasters are roughly divisible into two groups: (i.) those of larger size and more regular and typical form, provided with large spines, which comprise the majority of the microscleres scattered throughout the interior of the sponge; and (ii.) those of smaller size and variable form, with comparatively small spines, which chiefly compose the dermal crust. The largest of the former measure 45 by 8 μ, exclusive of spines; and their spines are, at most, 12 μ in length.

Remarks.—I have carefully examined many of the Cirripede-shells that occur in the specimens of this species, but in no case have I been able to detect (as in *Cliona lutea*) any sign of their perforation by the sponge.

Loc.—Port Jackson.

Raphyrus hixonii. (Pl. xvi., figs. 1, 2).

This species, so far known only in the free or raphyroid stage, is conspicuously characterised by a beautifully regular areolation of the surface (Pl. xvi., fig. 1), the areolæ being circular in outline, of diameter varying (gradually) over different parts of the surface from 3 to 6 μ, and placed at intervals apart of from 2 to 3·5 μ; the pattern of the areolation, when viewed from a distance, consequently appears hexagonal. Judging from the material at my disposal, which consists of some half-dozen large pieces of the original specimens (including the piece figured by Lendenfeld), and a small complete specimen obtained recently, the areolæ—except rarely and apparently abnormally—are situate on a level with the general surface, and are distinguishable to the eye only by reason of their difference in colour from the intervening areas;

only over a limited portion of the surface of one specimen are the areolæ at all depressed and pit-like. Accordingly, in conveying the impression that the reticulation of the surface is produced entirely by a "network . . . . of projecting lines" with "polygonal meshes" in which are "depressions about 4 or 5 mm. deep," the original description is quite misleading: one can see, indeed, from the figure in the "Catalogue" (Pl. i., fig. 3) how free from any pitted appearance is the portion of the surface therein shown.

The description is inaccurate also in several statements regarding the excurrent canal-system. We are told that vents are scattered over the surface and lead into short conic tubes, which are not oscula but præoscula; that these "short" (*sic*) tubes, which in the case of the original specimen are "nine in number and measure 250 mm. long by 20 mm. wide at the mouth," have their walls covered throughout by a reticulation similar to that of the exterior surface; and that proper oscula, 2 to 10 mm. in diameter, are scattered over the whole surface, including the sides of the conic tubes. After the most careful examination of the several specimens, I can find no reason to doubt (what, even at first sight, seemed most probable) that all the tubes referred to, including those leading from the so-called oscula, are nothing more than excavations made by crustaceans and other boring organisms, a considerable number of which are still present in most of the tubes; it is significant, also, that many of the smaller tubes are entirely filled with sand and mud. The tubular excavations are everywhere lined with a dense tough rind, often exceeding 1 mm. in thickness, composed almost entirely of closely packed megascleres; on no part of their wall, have I seen any trace of areolation.

If the soft tissues be removed by means of a macerating agent, there remain (Pl. xv., fig. 2) finally (i.) the rind-like cortical layer forming the outer surface; (ii.) the rind which lines the above-mentioned cavities; and (iii.) extending through the whole interior, a coarse network of somewhat flattened or strap-shaped trabeculæ, similarly constituted to the "fibres" of *Spirastrella australis* and *Spirastrella*(?) *ramulosa*, which are ordinarily 0·5 mm. to 1 mm. broad, and enclose meshes, on the average, several millimètres in

width. In reference to the pattern of this network, I need only mention here that, in the peripheral layer of the sponge, to a considerable distance below the surface, the trabeculæ are so arranged as to form incomplete boundaries between elongated "cells," the outer ends of which correspond in position with the areolæ of the surface, and the disposition of which, relatively to one another and to the exterior, is exactly similar to that of the cells of a honeycomb. In the case of the small specimen before me, the trabeculæ forming these cells still retain their separate individuality, thus enabling one clearly to distinguish between (i.) main ones, relatively few in number, running in the longitudinal direction of the cells, *i.e.*, perpendicularly to the surface, and (ii.) more numerous transverse or connecting ones; but in the large (and older) specimens, presumably as the result of the increase in width and gradual concrescence of the trabeculæ, and of the consequent reduction (even to the point of complete obliteration) of the intervening meshes, the condition is such that the cells are divided from one another by almost or quite comp'ete partitions, and thus bear a structural likeness to the cells of honeycomb, which is almost perfect.

The cortical rind, which is of very firm, dense, and fairly tough consistency, varies in thickness, in the different parts of the surface, from about 0·5 mm. to upwards of 1 mm. In the macerated sponge, it separates from the underlying skeleton with the greatest ease, and is then seen to be not less thick, or scarcely less thick, at the position of the areolæ than elsewhere; accordingly, the original description seems again to be at variance with fact, when it speaks of "membranes which extend in the meshes of the surface-network," and mentions, further, that these membranes have "groups of small pores" situated in them and are "very thin and delicate." The skeleton of the cortex, apart from a thin external layer of microscleres (of the two non-oxeote kinds) consists of closely packed tylostyles, the most superficially situated of which are disposed vertically to the surface; within the circular meshes or areolæ, the skeleton is much less dense, and the cortex is, consequently, much softer than in the intervals between.

Spicules. – The tylostyli are straight or nearly so, gradually sharp-pointed, and of approximately uniform diameter throughout more than three-fourths of their length; are usually provided with a phyma of moderately large size, which is of very variable shape, and is frequently asymmetrical and misshapen; and measure from 330 to 450 μ in length by 12·5 μ, at most, in diameter. Styli, of similar dimensions, occur, but are comparatively rare. The microscleres are of three kinds: (i.) spirasters of variable form; frequently with a straight or nearly straight axis; with usually more or less radially disposed, not numerous, spines, the length of which is not greater than the diameter of the spicule; rarely more than 30 μ long; and in different specimens varying in maximum diameter from 5 to 7 μ, exclusive of spines. (ii.) Minutely and closely spined, generally straight, truncately-ended rods; 7 to 19 μ in length; and seldom more than 3 μ in diameter, inclusive of spines. (iii.) Sharp-pointed slender acanthoxea; with a not very pronounced, elongate, median, spiral flexure of usually less than one complete turn; with linearly and usually spirally arranged, sharp, slender spines, the length of which sometimes exceeds the diameter of the spicules; varying in length from 55 to 110 μ; and rarely more than 2·5 μ in diameter.

Loc.—Port Jackson.

Remarks.—I regard this species, provisionally, as belonging to a subgenus of *Cliona*, having as its type *Papillissa lutea* Lendf., and including *Spirastrella areolata* Dendy(14).

Very closely allied to *Cliona hixonii*—although to be regarded, I think, as a quite distinct species – is another large sponge from Port Jackson (represented in the Australian Museum by a single specimen), in which (Pl. xvi., figs.3, 4), instead of a simple areolation of the surface, there are low papillæ of very uniform size, shape, and distribution, and more widely separated from one another than the areolæ of *C. hixonii*; and in which, also, the microscleres corresponding to those termed by me spirasters in the above description, are comparatively short and stout, and provided with close-set, fairly large spines that often show a tendency to assume a whorled arrangement.

Topsent(46), in describing *Cliona celata*, has drawn attention to a number of points of resemblance between it and *C. hixonii*, and expresses the opinion that "un rapprochement entre les deux espèces est tout indiqué." The additional information which I have furnished concerning the microscleres of the latter, shows, however, that there is not such a close analogy between the spiculation of *C. celata* and that of *C. hixonii* as Topsent supposed, and particularly is it questionable whether the oxea "lisses, acérés aux deux bouts, légèrement courbés, très fins" of the former are homologous with the acanthoxea of the latter.

In their possession of a vestigial spiral flexure, and of spines linearly and in some degree spirally disposed, the acanthoxea of *C. hixonii*, as well as those of the next-described species (*C. lutea*),* exhibit characters which render it practically certain that they are derivatives of spirasters. They are, thus, quite unlike the acanthoxea of such species as *C. vastifica* Hancock, *C. stationis* Nassanow, and *C. velans* Hentschel, which are quite devoid of any sign of spirality, which are provided with numerous very minute uniformly distributed spines, and which frequently exhibit a centrotylosis; the latter spicules, indeed, are regarded by Topsent as belonging to the category of megascleres. I consider it exceedingly probable, therefore, that acanthoxea have originated in the genus *Cliona* in two independent ways; and it is possible that those of *C. vastifica*, etc., are derived from smooth oxea such as do occur in some species of *Cliona*, and which perhaps are of common origin with the tylostyli.

Papillissa lutea. (Pl. xviii., figs. 1, 2)

Though I do not doubt that the several specimens labelled *Papillissa lutea*, in Lendenfeld's handwriting, are genuine examples of the species, I am at a loss to account for the absence of any reference in his description to the fact that they are

* In *Cliona areolata* (formerly known as *Spirastrella areolata*) also, of which species I have seen a mounted section presented to the Australian Museum by Professor Dendy, the acanthoxea are undoubtedly spiraster-derivatives; and, in the case of *C. margaritifera* Dendy(15), an actual transition between acanthoxea and spirasters has been recorded.

almost completely packed throughout with the shells of operculate Cirripedes, and I cannot understand how, under the circum stance, Lendenfeld was able to speak with confidence concerning the arrangement of the canals. One can only assume that he looked upon the inclusion of the shells as fortuitous, and on that account scarcely worthy of mention, and that his opinion regarding the canal-system was arrived at by inference rather than actual investigation. The most considerable mistake, however, made by Lendenfeld in connection with this species, lies in the fact that a specimen of it has been figured by him in the Catalogue (Pl. i., fig. 1) as *Papillina panis*.

In agreement with the description of the species, the type-specimens are massive, irregular, more or less laterally expanded (*i.e.*, depressed) sponges of moderate size, are covered with papillæ (of variable size and distribution), are of a yellowish-white colour in spirits, and (in some cases) exhibit circular oscula-like openings scattered irregularly over the surface. Lendenfeld says of these openings, or "vents" as he terms them, that they are not true oscula, but "lead into a system of vestibular lacunæ which occupies the interior of the sponge": in view of the fact that, in almost all other respects, the specimens afford practically indisputable evidence of their identity with *Papillissa lutea*, I venture to say that, as regards the nature of the "vents," Lendenfeld was entirely in error. In every case, I have found that these openings are situated each immediately above the orifice of an inhabited Cirripede-shell; and it is clear that they are simply the means whereby the crustaceans maintained communication with the exterior. All indications point to the fact that, with continued growth of the sponge, these openings gradually become closed over and finally disappear from external view.* It is

* At the time of writing the above, I was inclined to attach some importance to the presence of these Cirripedes, thinking it likely that the case was one of regular symbiosis; but I have since observed sporadic occurrences of a similar association in various species. Owing to the abundance of these shells in the specimens, I have not been able to determine, with certainty, whether *C. lutea* possesses anything analogous to the trabecular skeleton of *C. hixonii* or not.

interesting to note that many of the shells, even in the upper part of the sponge, are penetrated by tubular excavations similar in nature to those produced by other species of *Cliona*.

Spicules.—The tylostyli are straight or nearly so, gradually sharp-pointed, and of nearly uniform diameter throughout three-fourths or more of their length; they are provided with a rather large phyma of variable but usually symmetrical shape, which is often surmounted by a smaller dome; and they measure from about 300 to 490 μ in length by 13 μ in maximum diameter. Occasional styli of the same dimensions are met with. The microscleres are of three kinds : (i.) spirasters, of variable form; usually with a nearly straight axis; provided with spines of medium length, rarely exceeding the diameter of the spicule, and more or less spirally disposed; rarely less than 25 or more than 45 μ in length; and measuring up to 6 μ in stoutness, exclusive of spines. (ii.) Cylindrical, slightly undulating or spiral, truncately-ended, very minutely and closely spined rods; seldom less than 10 μ or more then 30 μ in length; and rarely exceeding 3 μ in diameter, exclusive of spines. (iii.) Spined microxea; similar to those of *Cliona hixoni*; 55 to 110 μ in length.

Loc.—Port Jackson.

Remarks.—For reasons indicated in my remarks on *Cliona hixoni*, I propose that *Papillissa* be provisionally retained as a subgenus of *Cliona*.

Familia SUBERITIDÆ.

In addition to *Plectodendron elegans*, dealt with below, there is described in the Catalogue, under this family, a species, recorded from Port Jackson and the South Coast of Australia, to which Lendenfeld attached the name *Suberites domuncula* Nardo. The identity of this sponge, I have been unable to determine. A specimen labelled, in Lendenfeld's handwriting, "*Suberites domuncula*, Port Jackson," is preserved in the Australian Museum, and a fragment of a specimen, bearing the same name and locality, has been received from the British Museum; but these agree neither with the description given nor with one another,—although both, how-

ever, are examples of species of *Suberites*, and both exhibit much the same pattern of skeleton as that apparently of the species described. For one thing, their spicules are too large, —the maximum sizes of these, in the two cases, being respectively 800 by 14 μ and 1040 by 19 μ, as against 700 by 8 μ, the size stated by Lendenfeld ; and in addition to this, the spicules of the second (*i.e.*, the British Museum) specimen are *not* "constricted below the bulb," and are almost as frequently *rounded off* at the apex as they are "sharp-pointed," while those of the first-mentioned, although actually narrowed towards the base and gradually sharp-pointed at the apex, are characterised, not by a "spherical bulb," but by one, the surface of which, as a rule, is uneven and somewhat tuberculate. Lendenfeld also states, concerning the spicules, that "the bulb is situated a little below the termination ; the truncate end of the spicule appears as a slight centrally situated excrescence of the bulb" ; but in neither of the specimens do the spicules exhibit such a peculiarity, save exceptionally.

Nevertheless, in view of the frequently only rough approximation to accuracy of the measurements and descriptions of spicules given in the Catalogue, I should, perhaps, have been disposed to regard the Australian Museum specimen as a genuine example of the species, but for the fact that it also fails to comply with the description in certain additional respects. The description states that the sponge "always forms the abode of a crab" ; that the largest Australian specimens measure only 35mm. in breadth and 15mm. in height ; and that the main exhalant canals, 1mm. wide, "are not rare in the interior and pour their contents into the wide and short oscular tube." On the other hand, the specimen is merely borne loosely (in the form of a thick concave plate) upon the back of a crab ; measures 60mm. long by 45mm. broad ; and is without apparent oscula or canals visible to the naked eye. This specimen is apparently of the same species as one in the British Museum labelled "*Suberites lamella*, Port Jackson."

There is also included, among the fragments received from

the British Museum, a tiny piece labelled "*Suberitella laxa*, Port Jackson," the spicules of which correspond to the description of those of the so-called *Suberites domuncula* exactly in every way, excepting that they never attain to more than 300 μ in length. It would be interesting to know whether this sponge agrees with the description of the species in question in other respects; if it does, one would be justified, I think, in identifying the latter (as recorded from Port Jackson) with it.

PLECTODENDRON ELEGANS. (Pl. xviii., fig. 1).

In the pattern of its skeleton and the form of its spicules, *Plectodendron elegans* bears an almost exact resemblance to a species, represented in the Australian Museum by two specimens from N.W. Australia, which I unhesitatingly identify as *Caulospongia verticillata* Kent(22); as the two species are congeneric, and each is the type of its genus, *Plectodendron* is, consequently, a synonym of *Caulospongia*. Kent described also, from an unknown locality, *Caulospongia plicata;* and Bowerbank (3a) described, at a later date, as new, from Western Australia, *Chalina verticillata;*—both of which species appear to me to be identical with *Caulospongia verticillata*. In spite of these several descriptions of its type-species, the genus *Caulospongia*, for some reason, never gained recognition, and since the time of its erection (1871) has apparently received no other mention than that by Vosmaer(50), who lists it among the genera, the systematic position of which "absolut unsicher oder unbekannt ist," and that by Topsent(46), who quotes it as a synonym of *Semisuberites* Carter(4); but for this identification, there appears to be no foundation.

The main skeleton, in the several species of *Caulospongia* known to me, is a very irregular, small-meshed reticulation of spicules and spiculo-spongin fibres, some of which fibres are stout and densely multi-spicular: the pattern of the skeleton is such that, if the stouter fibres were absent, one might describe it as confusedly renieroid. In *C. elegans*, spongin is

barely more than sufficient in quantity to bind the spicules together; but in another (undescribed) species, it is developed fairly abundantly and forms a well-defined sheath to all but the slenderest fibres. The spicules are of a single kind, and of characteristic form; they are tylostyli with a much depressed phyma, which makes them appear nail-shaped. Of the dermal skeleton of *C. verticillata* I cannot speak, since both specimens at my disposal have the surface completely abraded; but in *C. elegans*, and in the undescribed species, (which comes from the south coast of Australia, and in habit somewhat resembles *C. elegans*), there is a well-defined dermal membrane containing tangential, reticulately-arranged spicules and provided also with slightly projecting spicules directed vertically. The dermal membrane of *C. elegans* is thin and translucent; that of the undescribed species is much more densely charged with spicules, and, in the dry sponge, appears as a well-marked, easily separable, whitish pellicle.

This combination of characters, to which might be added the non-massive external form of the sponge(Pl.xviii., fig.1), definitely distinguishes *Caulospongia* from any other genus of the *Suberitidæ*. Indeed, owing to the considerable degree of development of spongin, it is somewhat doubtful whether the genus really is related to the *Suberitidæ*, although in *Laxosuberites*, spongin, in small amount, is said to occur.

Lendenfeld's description of *C. elegans* is, in the main, correct, and is sufficient to enable the species to be identified: in the type-specimens, the spicules measure from (rarely) less than 140 μ to 220 μ in length, and attain 11 μ in diameter

Loc.—Port Jackson.

Familia CHONDROSIDÆ.

Chondrosia collectrix.

Introductory.—The type-specimen, allowance being made for its being only a portion of the original, is consistent in every way with the description except as regards colour, and perhaps also certain features of the canal-system—more espe-

cially those involved in the statement that "subdermal cavities are found in the shape of tangentially extended canals 0·2 mm. below the surface, which are, on an average, 0·17mm. wide, and connected with inhalant pores on the outer surface by straight or curved canals, 0·024mm. in diameter." The presence of these subdermal spaces, canals, and pores, I have been unable to demonstrate; but the sponge is so loaded with foreign matter, including abundant and often large sand-grains, that thin sections are possible only after prolonged desilicidation, and it is then very difficult to distinguish between spaces proper to the sponge and those due to particles removed. I have found another (apparent) example of the species, however, which, throughout considerable portions of the interior, is comparatively free from inclusions; and this differs from the type-specimen in other respects also. It has been described by Whitelegge(56) under the name *Reniera collectrix*, of which species it is labelled as the type; for the reasons given below, I am of opinion that it is correctly labelled so, and accordingly hold *Chondrosia collectrix* and *Reniera collectrix* to be synonymous.

Description.—The sponge is provided with a thin cortex, not easily separable nor distinctly marked off from the underlying tissue, which is of a pale greyish or dirty-white colour, and generally about 0·2 or 0·3mm. in thickness. In the type-specimen of *Reniera collectrix*, the colour of the choanosome, where not disguised by foreign inclusions, is brownish-yellow, and this is in accordance with Lendenfeld's statement regarding the internal colour of *Chondrosia collectrix;* but in the type-specimen of the latter species, the colour is greyish, and scarcely different from that of the cortex. The two specimens also differ very considerably in consistency. The former, where most free from inclusions, is dense, fleshy, firm, and fairly tough; but the latter, owing to the abundance and mainly arenaceous nature of the foreign elements, is, for the most part, hard and gritty. The "slightly conulated" appearance of portions of the surface, referred to by Lendenfeld, is

merely an unevenness due to the presence, close below the cortex, of occasional, rather large grains of sand, etc.; what other inequalities of the surface there are, appear to be the result rather of irregularity of growth than of any definite tendency or habit of growth. Oscula, or openings resembling oscula, were observed only in the complete specimen; they are situated in two small groups, and in each group are closely arranged, and of variable diameter up to 2·5mm. The canals traversing the sponge are comparatively few in proportion to its mass, and at most only about 1mm. in diameter.

(The following brief account of the minute anatomy is intended mainly only as a guide to the identification of the species. A fuller description is necessary, but is scarcely possible with the material at my disposal, the condition of preservation of which, after nearly thirty years in spirit, leaves much to be desired.).

The cortex is without fibrous tissue, and consists of a kind of chondrenchyma. The mesoglœa is very extensively developed and characterised by a peculiar vesicular structure due to numerous very distinctly outlined, apparently empty, oval cells (cystencytes), which are arranged in clusters rather than uniformly distributed, and measure 15 μ to 20 μ in diameter. There is no proper skeleton, nor anything of the nature of connective tissue fibres. The chamber-system appears to be eurypylous. The flagellated chambers vary in shape, from oval to nearly spherical; in the type-specimen, presumably owing to contraction, they are very seldom much more than 30 μ (yet may attain to 40 μ) in diameter; but in the other specimen (*Reniera collectrix*), they are usually between 35 and 40 μ in diameter, while a certain few, which are more elongated and relatively narrower than the others, measure 45 by 30 to 35 μ. Inside most (if not all) of the smaller canals, lying in contact with, or in close proximity to, their wall, there occur a variable number of irregularly rounded cells, measuring 10 to 12 μ in diameter; the nature of these is not clear, but possibly they are algæ.

Loc.—Port Jackson.

Remarks.—Whether the species belongs naturally to *Chondrosia*, is doubtful; but it conforms more closely to the definition of that genus than of any other, and there is scarcely sufficient ground to warrant the introduction of a new genus for it.

It is quite possible that the differences between the two specimens described may prove to be specific.

REFERENCE LIST OF LITERATURE.

1. Bowerbank, J. S.—(i.) Rept. Brit. Assoc. 1868, p.333.
2. ———.———.———"A Monograph of the British Spongiadæ." Ray Soc. London; (*a*) Vol. i., 1864; (*b*) Vol. ii., 1869; (*c*) Vol. iii., 1874; (*d*) Vol. iv., 1882.
3. ———.———.———"Contributions to a General History of the Spongiadæ, Pt. i." Proc. Zool. Soc. Lond., 1872, pp.115-127.

3a. ———.———.———"Contributions to a General History of the Spongiadæ, Pt. viii." Proc. Zool. Soc. Lond., pp.768-775.

4. Carter, H. J.—"Arctic and Antarctic Sponges, etc." Ann. Mag. Nat. Hist.,(4), xx., 1877, p.38.
5. ———.———"Some Sponges from the West Indies and Acalpulco, etc." *Op. cit.*(5), ix., 1882, pp.266-301.
6. ———.———.———"Contributions to our Knowledge of the Spongida." *Op. cit.*(5), xii., 1883, pp.308-328.
7. ———.———.———"Descriptions of Sponges from the neighbourhood of Port Phillip Heads." *Op. cit.*(5), xvii., 1886, pp.40-53.
8. ———.———.———"Supplement to the Descriptions of Mr. J. Bracebridge Wilson's Australian Sponges. *Op. cit.*(5), xviii., 1886, pp.445-466.
9. ———.———"Report on the Marine Sponges, chiefly from King Island, in the Mergui Archipelago." Journ. Linn. Soc., xxi., 1887, pp.61-84.
10. Czerniavsky, V.—"Littoral Sponges of the Black and Caspian Seas." Bull. Mosc., liv., Pt. ii., 1880, pp.88-228.
11. Dendy, A.—"Report on a Second Collection of Sponges from the Gulf of Manaar." Ann. Mag. Nat. Hist. (6), iii., 1889, pp.73-98.
12. ———.———"Catalogue of Non-calcareous Sponges collected by J. Bracebridge Wilson, Esq., M.A., in the Neighbourhood of Port Phillip Heads." Part i. Proc. Roy. Soc. Victoria, (N.S.), 1895, vii., pp.232-260.
13. ———.———Ditto. Part ii. *Op. cit.*, viii., 1896, pp.14-51.
14. ———.———Ditto. Part iii. *Op. cit.*, ix., pp.230-259.

15. Dendy, A.—"Reports on the Sponges collected by Professor Herdman at Ceylon in 1902." Reports on the Pearl Oyster Fisheries of the Gulf of Manaar, Vol. iii., 1905, pp.59-246. (Royal Society, London).

16. Dragnewitsch—"Spongien von Singapore." Inaug. Diss. Phil. Fac. Bern, 1905.

17. Gray, J, E.—"Notes on the Arrangement of Sponges, with the Descriptions of some new Genera." Proc. Zool. Soc. London, 1867, pp.492-558.

18. Hallmann, E. F.—"Report on the Sponges obtained by the F.I.S. 'Endeavour' on the Coasts of New South Wales, South Australia, Queensland, and Tasmania." Part i. Zoological Results of the Fishing Experiments carried out by the F.I.S. 'Endeavour,' 1909-10, Part ii., pp.117-300. Sydney, 1912.

19. Hentschel, E.—"Tetraxonida. Teil i." Die Fauna Südwest-Australiens, Bd. ii., Lief. 21, 1909, pp.347-402. Jena.

20. ———————Ditto. Teil 2. *Op. cit.*, Bd. iii., Lief. 10, 1911, pp.279-393.

21. ———————"Kiesel- und Hornschwämme der Aru- und Kei-Inseln." Abh. Senckenb. Naturf. Gesell., xxxv., 1912, pp.295-448.

22. Kent, W. Saville.—"On a new Genus of Sponges from North Australia." Proc. Zool. Soc. Lond., 1871, pp.615-616.

23. Kirkpatrick, R.—"On the Sponges of Christmas Island." Proc. Zool. Soc. Lond., 1900, pp.127-140.

24. ———————"The Tetraxonida of the National Antarctic Expedition." Natural History Reports, Vol. iv., 1908.

25. Leidy, J.—"The Boring Sponge, Cliona." Proc. Acad. Nat. Sc. Philadelphia, 1889, Pt. i., pp.70-75.

26. Lendenfeld, R. von.—"Die Chalineen des Australischen Gebietes." Zool. Jahrb., ii., 1887, pp.723-828.

27. ———————"Descriptive Catalogue of the Sponges in the Australian Museum, Sydney." London, 1888.

28. ———————"Das System der Spongien." Biol. Centralbl., ix., 4, 1889, pp.113-127; Abh. Senck. Ges., xvi., Heft 2, 1890, pp.361-439.

29. ———————"Die Clavulina der Adria." Nova Acta: Abh. Kaiserl. Leop.-Carol. Deutsch. Akad. Naturf., lxix., 1896-7, pp.1-251.

30. Lindgren, N —"Beitrag zur Kenntniss der Spongienfauna des Malaischen Archipels und der Chinesischen Meere." Zool. Anz., xx., 1897, pp.480-487; Zool. Jahrb., Abt. f. Syst., xi., 1898, pp.283-378.

31. Lundbeck, W.—"Porifera. Part i. Homorrhaphidæ and Heterorrhaphidæ." Danish Ingolf Expedition, vi., Pt. 1, 1902.

31a. ———————Ditto. Part ii. Desmacidonidæ (partim). *Op. cit.*, vi., Pt.2, 1905.

31b. Lundbeck, W.—Ditto. Part iii. Desmacidonidæ (partim). *Op. cit.*, vi., Pt.3, 1910.

32. Pick, F. K.—"Die Gattung Raspailia." Arch. f. Naturg., 1905, i., Heft 1, pp.1-48.

33. Ridley, O. S.—"Spongida." Reports on the Zoological Collections made in the Indo-Pacific Ocean during the Voyage of H.M.S. "Alert," 1881-1882, pp.366-482, 582-630. London, 1884.

34. Ridley, O. S., and Dendy, A.—"Preliminary Report on the Monaxonida collected by H.M.S. 'Challenger'." Ann. Mag. Nat. Hist. (5), xviii., 1886, pp.325-351.

34a. ——————————"The Monaxonida." Reports on the Scientific Results of the Voyage of H.M.S. "Challenger," Zoology, xx., 1887.

35. Row, R. W. H.—"Report on the Sponges collected by Mr. Cyril Crossland in 1904-5. Part ii. Non-calcarea." Journ. Linn. Soc. London, Zool., xxxi., 1911, pp.287-400.

36. Sollas, W. J.—"The Tetractinellida." Reports on the Scientific Results of the Voyage of H.M.S. "Challenger," Zoology, xxv.

37. Sollas, I. B.—"The Inclusion of Foreign Bodies by Sponges, with a Description of a new Genus and Species of Monaxonida." Ann. Mag. Nat. Hist. (8), i., 1908, p.395.

38. Thiele, J.—"Studien über pazifische Spongien." 'Zoologica,' Heft 24, 1898.

39. ————Ditto. ii.Teil. *Op. cit.*, Heft 24, 1899.

40. ————"Kieselschwämme von Ternate. i." Abh. Senckenb. Naturf. Gesell., xxv., Heft i., 1900, pp.19-80.

41. ————Ditto. ii. *Op. cit*, xxv., Heft iv., 1903, pp.933-967.

42. ————"Die Kiesel- und Hornschwämme der Sammlung Plate." Zool. Jahrb. Suppl. vi., Dr. L. Plate, "Fauna Chilensis": iii., Heft 3, 1905, pp.407-496.

43. Topsent, E.—"Contribution a l'Etude des Spongiaires de l'Atlantique Nord." Resultats des Campagnes Scientifiques du Prince de Monaco, Fasc. ii., 1892.

44. ——————"Spongiaires de la Baie d'Amboine." Revue Suisse Zool,, iv., 1897, pp.421-487.

45. ————————"Introduction a l'Etude monographique des Monaxonides de France. Classification des Hadromerina." Arch. Zool. exp. et gen. (3), vi., 1898, pp.91-113.

46. ——————"Etude Monographique des Spongiaires de France. iii. Monaxonida (Hadromerina)." Arch. Zool. exp. et gen. (3), viii., 1900, pp.1-331.

47. ——————"Spongiaires des Açores." Resultats des Campagnes Scientifiques du Prince de Monaco; Fasc. xxv., 1904.

48. ————————Bull. l'Instit. Océanogr., 1912, No.252, pp.1-12.

49. Verrill, A. E.—"Characteristic Life of the Bermuda Coral Reefs. Porifera." Trans. Conn. Acad., xii., 1907, pp.330-344.

50. Vosmaer, G. C. J.—"Porifera." Die Klassen und Ordnungen des Thierreichs, ii., 1887.

51. ——————"The Porifera of the Siboga-Expedition. ii.The Genus Spirastrella." Siboga-Expeditie, Monogr. vi.a, Livr. lix., 1911, pp.1-67.

52. ——————"On the Distinction between the Genera *Axinella*, *Phakellia*, *Acanthella*, a.o." Zool. Jahrb. Suppl. xv., Bd. i., 1912.

53. Whitelegge, T. W.—"The Sponges of Funafuti." Mem. Austr. Mus., iii., Part 5, 1897, pp.323-332.

54. ——————"Report on Sponges from the Coastal Beaches of New South Wales." Rec. Austr. Mus., iv., No.2, 1901, pp.55-118.

55. ——————"Supplementary Notes to the Report on Sponges from the Coastal Beaches of New South Wales. *Op. cit.*, iv., No.5, 1902, pp.211-216.

56. ——————"Notes on Lendenfeld's Types described in the Catalogue of Sponges in the Australian Museum." *Op. cit.*, iv., No.7, 1903, pp.274-288.

57. ——————"Scientific Results of the Trawling Expedition on H.M.C.S. 'Thetis' off the Coast of New South Wales.—Sponges." Mem. Austr. Mus., iv., Part 9, 1906, pp.453-486; Part 10, 1907, pp.487-515.

EXPLANATION OF PLATES XV.-XXIV.

Plate xv.

Fig.1.—*Sollasella digitata* Lendenfeld; ($\times \frac{2}{3}$).

Fig.2.—*Sollasella digitata* Lendenfeld, from the type; ($\times \frac{2}{3}$).

Fig.3.—*Donatia fissurata* Lendenfeld; (slightly reduced).

Fig.4.—*Donatia phillipensis* Lendenfeld; surface-section showing the dermal reticulation, the primary meshes of which are subdivided (by lines of tylasters) into smaller meshes, each enclosing a pore; ($\times 18$).

Fig.5.—*Spirastrella*(?) *australis* Lendenfeld; a flabellate example; ($\times \frac{1}{2}$).

Fig.6.—*Polymastia zitteli*, from the type of *Sideroderma zittelii* Lendenfeld; (nearly nat. size). The specimen is in a fragmentary condition.

Plate xvi.

Fig.1.—*Cliona* (*Papillissa*) *hixoni*, from the type of *Raphyrus hixonii* Lendenfeld; portion of the exterior, showing the character of the surface-areolation; ($\times \frac{3}{4}$).

Fig.2.—*Cliona* (*Papillissa*) *hixoni*; showing the skeleton (after maceration by means of caustic potash) of a thick slice of a small specimen; (nat. size).

Figs. 3-4.—*Cliona* (*Papillissa*) sp., allied to *Cliona hixonii*; portions of the concave and convex surfaces respectively of a specimen having the form of a thick, curved plate, showing the character and arrangement of the surface-papillæ; ($\times \frac{3}{4}$).

Plate xvii.

Figs. 1, 2.—*Cliona* (*Papillissa*) *lutea*, from the types of *Papillissa lutea* Lendenfeld; ($\times \frac{1}{2}$).

Fig. 3.—*Spirastrella*(?) *australis* Lendenfeld; showing the skeleton (as prepared by maceration by means of caustic potash) of the specimen illustrated in Pl. xv., fig. 5; ($\times \frac{1}{2}$).

Fig. 4.—*Amorphinopsis megarrhaphea* Lendenfeld; dermal skeleton; ($\times 8$).

Fig. 5.—*Amorphinopsis megarrhaphea* Lendenfeld; pattern of the skeleton as shown in portion of a moderately thin section ($\times$ 10 approximately).

Fig. 6.—*Tedania digitata* var. *rubicunda*, from the type of *T. rubicunda* Lendenfeld; ($\times \frac{1}{2}$).

Plate xviii.

Fig. 1.—*Caulospongia elegans*, from the type of *Plectodendron elegans* Lendenfeld; ($\times \frac{2}{7}$).

Fig. 2.—*Axiamon folium*, sp. nov.; ($\times \frac{4}{9}$).

Fig. 3.—*Axiamon folium* (var.?); ($\times \frac{4}{9}$).

Fig. 4.—*Hemitedania anonyma* Carter; from a specimen of somewhat cartilaginous consistency, and with coarse-fibred skeleton; ($\times \frac{1}{2}$).

Plate xix.

Fig. 1.—*Hemitedania anonyma* Carter, from a specimen labelled as the type of *Halichondria rubra* Lendenfeld; ($\times \frac{3}{4}$).

Fig. 2.—*Hemitedania anonyma*; from a macerated, coarse-fibred specimen; ($\times \frac{1}{2}$).

Figs. 3, 4, 5.—*Hemitedania anonyma*; illustrating various forms assumed by examples of this species; ($\times \frac{1}{2}$ approximately).

Plate xx.

Fig. 1.—*Chalina finitima* Whitelegge (non Schmidt); an incomplete specimen.

Fig. 2.—*Phlæodictyon ramsayi*, from one of the co-types of *Rhizochalina ramsayi* Lendenfeld; illustrating a specimen of irregular shape provided with *many* root-like processes.

Fig. 3.—*Phlæodictyon ramsayi* var. *pyriformis* (var. nov.); portion of the upper surface showing the sieve-like area formed by the closely apposed oscula; ($\times \frac{2}{3}$)

Figs. 4-5.—*Phlæodictyon ramsayi*; tangential sections close beneath the surface, showing the pattern of the reticulation formed by fibres of the bast-layer in the wall of the fistula and in between the fistulæ respectively; ($\times$ 10).

Plate xxi.

Figs. 1, 2, 3, 4.—*Stylotella agminata* Ridley, from type-specimens of *Stylotella digitata* Lendenfeld, and of *Tedania laxa* Lendenfeld; (× ½ approximately).

Fig. 5.—*Stylotella agminata* Ridley; further illustrating the variable habit of the species.

Plate xxii.

Fig. 1.—*Axinella aurantiaca* Lendenfeld; longitudinal median section taken at the extremity of a thin branch; (× 15).

Fig. 2.—*Stylotella agminata* Ridley; longitudinal section taken at the extremity of a branch; (× 12).

Fig. 3.—*Histoderma actinioides*, sp. nov.; (× ⅔ approximately).

Fig. 4.—*Phlœodictyon ramsayi* Lendenfeld, var. *pyriformis* (var. nov.); inner surface of longitudinally bisected specimen, showing disposition of oscular canals; (× ⅔).

Fig. 6.—*Spirastrella*(?) *ramulosa* Lendenfeld; showing the skeleton which remains after maceration by means of caustic potash; (× ⅔).

Fig. 6.—*Raspailia tenella* Lendenfeld; longitudinal median section taken at the extremity of a branch; (× 12).

Fig. 7.—*Raspailia gracilis* Lendenfeld; longitudinal section of a branch; (× 9).

Plate xxiii.

Fig. 1. *Raspailia gracilis*, from the type of *Axinella hispida* var. *gracilis* Lendenfeld; (× ¾).

Figs. 2-3.—*Raspaila tenella*, from the types of *Axinella hispida* var. *tenella* Lendenfeld; (× ¾ approximately).

Fig. 4.—*Raspailia agminata*, sp. nov.; from the specimen wrongly figured in the Catalogue (Pl. ii., fig. 1) in illustration of *Halichondria rubra*, var. *digitata* Lendenfeld; (× ¾).

Fig. 5.—*Chalinodendron dendrilla* Lendenfeld; (× ⅛).

Plate xxiv.

Fig. 1.—*Mycale* (*Paresperella*) *penicillium* Lendenfeld; dermal skeleton; (× 18).

Fig. 2.—*Tedania digitata* var. *rubicunda* Lendenfeld; dermal skeleton; (× 18).

Figs. 3, 4, 5.—*Hemitedania anonyma* Carter; dermal skeleton; (× 18).

Fig. 6.—*Mycale serpens* Lendenfeld; dermal skeleton.

Figs. 7, 8.—*Axiamon folium*, sp. nov.; pattern of the skeleton as shown in moderately thin sections. Fig. 7, (× 10).